N A R R A T I V E R E P O R T

GREAT SWAMP NATIONAL WILDLIFE REFUGE
Basking Ridge, New Jersey

JANUARY - DECEMBER 1971

UNITED STATES DEPARTMENT OF INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE
GREAT SWAMP NATIONAL WILDLIFE REFUGE

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C.O.

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PERMANENT PERSONNEL

George W. Gavutis, Jr.	Refuge Manager (In-Charge)
Thomas G. Mitchell	Refuge Manager (Assistant)
Robert L. Delaney	Refuge Manager (Trainee), Transferred to Iroquois NWR 10/15/71
Herbert B. Bell	Refuge Manager (Trainee), EOD: 6/27/71
Elizabeth A. Chapman	Public Use Specialist
Donald P. Goss	Maintenanceman
George F. Bagley, Jr.	Maintenance Worker
Anita E. Penn	Clerk-Typist

TEMPORARY PERSONNEL

William Koch	Refuge Manager (Trainee), EOD: 12/27/71 NTE: 12/26/72
Brian Bacon	Student Aid (P/T-Interm), Term: 9/28/71
Diana L. Batlas	Student Aid, 5/30/71 - 8/31/71
Maurice Mills	Student Aid, 5/30/71 - 9/10/71
Donald P. Weston	Student Aid, 6/31/71 - 9/10/71
Douglas E. Roscoe	Laborer, 1/11/71 - 5/10/71, Student Aid, 5/16/71 - 9/3/71
Harold S. Bell	Laborer (P/T-Interm), EOD: 11/1/71
Richard W. Cole	Laborer, 6/14/71 - 8/27/71
Kenneth Dickson	Laborer, 6/14/71 - 9/21/71
James Darrois	Laborer, EOD: 10/18/71
Stephen L. Flanagan	Laborer, 7/1/71 - 9/1/71
Louis S. Hinds III	Laborer, 7/1/71 - 9/7/71
William J. Freese	Laborer, EOD: 10/18/71
Jeffrey Ulrich	Laborer, 7/18/71 - 9/15/71
Marsha A. Verderber	Clerk-Steno (P/T-Interm), Term: 4/6/71

I. GENERAL

A. Weather Conditions. Weather records were compiled from information collected at the weather station behind Quarters 1. Information on normal precipitation was obtained from 41 years of records from the Canoe Brook Weather Station near Summit, located 10 miles east of refuge headquarters.

	Snowfall		Precipitation		Temperature	
	1971	Normal	1971	Normal	Max	Min
Jan	17.50	7.1	3.54	3.66	46	-9
Feb	2.00	8.1	5.58	2.96	61	-5
Mar	5.00	4.3	3.60	4.30	71	17
Apr	4.00	1.0	2.72	4.02	78	23
May		Tr	4.47	4.15	85	26
June			1.14	4.03	91	45
July			5.50	4.55	93	43
Aug			14.07	5.23	90	40
Sept			9.45	4.32	91	35
Oct		Tr	4.32	3.41	79	34
Nov		1.2	6.90	4.10	77	18
Dec	1.00	5.2	1.91	3.65	62	11
Totals	29.50	26.9	63.20	48.38		
Extremes					93	-9

According to the New York City weather bureau office 30 miles to the east, 1971 came within an inch of exceeding the all-time precipitation record set in 1907. Annual precipitation was nearly 15 inches above normal, with 14.07 inches falling in August (10.5 inches in 18 hours) and 9.45 inches in September. January was cold and snowy, but spring arrived early in February. April was dry enough to cause most local parks to close due to the fire hazard. June was also dry, but by late July rainy weather had returned. The last widespread frost (26 degrees) occurred on May 5, but a 32-degree reading was recorded on May 15. The first widespread, killing frost in the fall was on November 5. December was abnormally warm and dry.

B. Habitat Conditions.

1. Water. The warming trend and rain in February created four spring floods, two of which overtopped Pleasant Plains Road north

of Q-1. Lord Stirling Road was closed most of February due to flooding by the Passaic River. Pleasant Plains Road was again overtopped with several inches of water on August 2. The record-breaking rains from hurricane Doria in late August produced the worst flood in history locally, and water had just dropped back near normal when heavy rains spawned a "60 year" flood on September 13. Water stayed high throughout the fall, and skim ice had formed several times by the end of November. Most water areas remained unfrozen at the year's end.

2. Food and Cover. Waterfowl food was excellent throughout the year. Nearly all water areas were covered with growths of duckweed. Proposed Pools 1, 2, and 3 and Middle Brook in the Management Area, and the Great Brook marshes in the Wilderness Area, received the heaviest waterfowl use. All of these areas had an abundance of flooded smartweed, buttonbush, duck potato, sedges, nut grasses, and burreeds. During the late summer many portions of the Wilderness Area that were dry most of the summer, particularly along Great Brook and Tichenor Ditch, were temporarily flooded, making sedges and weeds available to feeding ducks. Crop and grass fields in the Management Area, also flooded during the late summer and fall, were used extensively by ducks, geese, and shorebirds. There were no substantial feeding flights by ducks noted to Proposed Pool 3 this year. Pools 1 and 2 again provided the major duck roosting sites. A 10-acre buttonbush, reed canary grass, and flooded smartweed site north of Great Brook on Tracts 224 and 10n of the Wilderness Area served as a roost for up to 1,500 wood ducks and our local Canada goose flock during the late summer and fall. Several hundred mallards, blacks, pintails, widgeon and teal also used that area during the day but generally roosted in the Management Area at night. A flooded brush area east of the old Meyersville Road was used for roosting by up to 700 wood ducks.

Dense stands of lizard tail continued to increase in flooded portions of Tracts 10g and 10ab adjacent to Black Brook in the Wilderness Area. This provided excellent brood-rearing cover. A new beaver dam near the concrete culvert plant on Black Brook flooded at least 50 to 75 acres upstream just southwest of the Dodge Unit. This area was undoubtedly well used by broods and local ducks until the waterfowl hunting season.

Acorn production was much reduced compared with last year's heavy production. Only the pin oaks had good to excellent production which was well utilized by ducks, deer, squirrels, and pheasants. A prominent browse line on red cedar and "lollipop"-shaped high bush blueberry continued to illustrate our overpopulation of deer.

All common plant species such as red osier dogwood, birch, red maple, and blueberry seemed to be heavily browsed this year. Deer also browsed extensively on the thousands of saplings and small trees which were felled in conjunction with our field rehabilitation and dike construction programs. More than 5 acres of winter rye planted in early fall on old building sites, roadbeds, and crop fields was used extensively by deer. Deer also extensively grazed all the mowed grass, weed and brush fields. Deer damage complaints by refuge neighbors and nurserymen decreased substantially this year due to the increased food available on the refuge and the mild weather.

Our goose flock made significant use of the rye browse and mowed pasture fields near the Wildlife Observation Center blind and on Tract 247b. Several acres of mud flats at the W.O.C. and along Middle Brook were seeded to Japanese millet with moderate success.

II. WILDLIFE

A. Migratory Birds. Evening counts of the Proposed Pools 1 and 2 area were conducted weekly during migration and late summer from the adjacent field on Tract 247b. Periodic counts were also made at Proposed Pool 3 and several locations in the Wilderness Area. Our waterfowl use continued to increase substantially despite the fact that we do not yet have any major water control facilities. Our spring duck peak was an all-time high of 4,446 (up 25% from the 1969 record). Spring use days were 182,000 (up more than 60% from the previous record in 1970). Hooded mergansers and common mergansers, the first recent sighting for these species, were seen early in spring, and a few coots were noted later on. A goldeneye was seen on Middle Brook by Mr. Mitchell on March 6, adding this species to our bird list.

No extreme weather or water conditions occurred during the nesting season, setting the stage for good production. One hundred and four new wood duck boxes were added prior to the 1971 nesting season, making a total of 211 available. Woodies used nearly all of them (quite a few twice) for a hard-to-believe total of 209 nests in 211 boxes. Previous use was 55 nests in 107 boxes in 1970 and 9 nests in 45 boxes in 1969.

Hay was removed from all of the 32 hammock nests installed in 1969 due to excessive predation by raccoons. The 50 "raccoon-proof" mallard boxes that were installed in 1970 and received 10% use were supplemented with 25 fiberglass nest cones and 27 guarded hardware-

cloth nest cones prior to the 1971 nesting season. The mallard boxes received 30% use this year (12 mallards and 3 geese - see photos). Twenty percent, or five, of the fiberglass cones were used (all by mallards), and 44%, or 12, of the hardware cones were used (all by mallards). As we expected, the mallards took to the hardware cones almost as well as they had to the unguarded hammock nests the previous years. One or two of the mallard nests in each type of device were destroyed by coons which were able to get around the guards on growing or fallen branches. No avian predation was noted. The 12 goose and 42 mallard nests located during our rambles through the marshes were nearly the same numbers seen in 1970. Seven of our 50 small nesting islands were used by mallards and four by geese. Most of the mallard nests were destroyed, and two of the goose nests met the same fate. Many other mallard nests were found on natural islands and grassy hummocks, but most of those were also destroyed. A few geese also nested on muskrat houses and hummocks.

Due to a heavy workload we did a lot less rambling this year. Only two wood duck nests were noted in natural cavities, but we feel sure that substantial tree nesting does occur on and near the refuge.

For the third year in a row, breeding pairs of blue- and green-winged teal were seen on the refuge, and for the second year several gadwall pairs were also noted. We discontinued our blue-wing and gadwall duckling transplants this year. The blue-wings are now nesting in limited numbers, but the gadwalls don't seem satisfied with our habitat. We may try the gadwalls again once our pool development is completed.

At least 15 pairs of geese set up territories this year, compared with 15 in 1970, 4 in 1969, and 1 in 1968. The pair that used the Q-1 pond for the last two years returned early this spring with its entire brood from last year. After getting rid of the kids and some nosey neighbors, they set up housekeeping on an island 150 yards northeast of Q-1 once again.

Although no formal brood counts were conducted, 77 duck broods and 12 goose broods were recorded, compared with 81 and 11 respectively last year. No blue-wing broods were seen (our first was seen last year), but some production probably occurred. A brood of green-wings was noted in the Dodge Unit of the Wilderness Area (two broods were seen for the first time last year). No black broods were observed in the flooded timber of the Dodge Unit or the Management Area; five and one respectively in each area were seen last year. Total refuge production was estimated at 2,420 for ducks

(compared with 1,770 in 1970 and 1,040 in 1969) and 55 for geese (compared with 25 in 1969 and 35 in 1970). Most of our 1969 goose production was goslings transplanted from Brigantine Refuge. A special effort (Wildlife Management Study) will be made to band a sample of our production throughout the refuge starting next year. We feel certain that the greatly reduced time afield due to our heavy workload caused the reduction in brood sightings rather than any actual decrease in production. It is also most likely that quite a few broods moved to the new beaver swamp just southwest of the Dodge Unit.

Parts of several wood duck and mallard broods were again brought into the headquarters from around the refuge and beyond. They had been trapped in backyard fences, culvert pipes and swimming pools by dogs, cats, and people. Most were liberated in the goose pen marsh where we could keep an eye on them, and survival was surprisingly high. This was more waterfowl production than could have been seen in the entire season on the refuge just a few years ago.

Despite the low water, our summer waterfowl use was high, with several thousand breeders and young ducks (mostly wood ducks and mallards) present. The late summer flood kept our mallard and wood duck populations high and encouraged up to 400 blue-winged teal to visit. A few shovelers, pintails, and widgeon were also noted. Fall use built steadily with the continued high water, peaking at 6,398 ducks in mid-November (same time as last year). This peak was nearly 1,000 birds less than last year, primarily because mallards didn't peak until mid-December this year.

Total duck use days were approximately 45% higher than last year's record. Two hundred and fifty brant were heard and then seen heading south over the Wildlife Observation Center blind in mid-October. Canada goose use was more than double that of last year's, primarily due to increased fall use by local flocks. Peak goose use was substantially higher in all seasons. During the fall, several high-flying flocks looked us over and a few birds even dropped down, but the leaders talked them into continuing on their way. A snow goose was seen at the W.O.C. on October 20. This species was first seen here the previous spring. A free-flying mute swan was seen near Q-1 during the flood on August 30, adding this species to our bird list.

This is the first year that our duck use days have exceeded one million. We have already exceeded the total use-day objectives called for in the master plan but have not yet reached either spring or fall use-day or peak-population goals called for in the plan. This is primarily due to our high production and summer use. Our

production is already 40% above that originally anticipated after full development.

WATERFOWL USE DAYS PER ACRE OF USE HABITAT

	Ducks	Geese
Use Days	1,206,572	35,410
Acres of Habitat	5,000	1,200
Use Per Acre of Habitat	241	30
Acres of Wetland	3,000	1,000
Production Per Wetland Acre	.806	.055

Small groups of coots were noted in the Great Brook marshes several times during the spring migration. Four coots were noted behind Q-1 during our first fall flood; a group was noted on Great Brook in the Wilderness Area in November; and at least 50 were gathered at the open water near the Pool 1 dike in late November. We still have not noted any local production by coots.

The golden plover was added to our bird list on September 16 when Mr. Gavutis noted one in a plowed field on Tract 234. Our faith in our "reliable" local birdwatchers was badly shaken when dozens of different individuals identified it as a buff-breasted sandpiper, an upland plover, or couldn't make up their minds what it was. Some even suggested that all three species were present in the field, but every time we checked we saw a golden plover.

Least bitterns were regularly noted in the Great Swamp marshes, and several nests were found for the first time. Three least bittern nests were located; two were successful and the young were banded. This species is listed as "status undetermined" by the State of New Jersey. The State lists the yellow-crowned night heron as "rare", and there were no sightings of yellow-crowns here this year.

Gallinules and rails continue to become increasingly common throughout the refuge. Several broods of Virginia rails were again seen during the summer. Our first breeding record for king rails was made on July 27 when a brood of three was seen near the restored upland ponds on Tract 247b. The State lists king, yellow, and black rails as "rare". Dowitchers were seen in the goose pen for the second year in a row. Populations of other marsh and shore birds were similar to 1969 and 1970.

B. Upland Game Birds. Ruffed grouse, ring-necked pheasant, and bob-white populations remained relatively low. Five pheasant broods were seen, four less than last year and the same as the year before. For the second year, two of the sightings were near the east and

south edges of the Wilderness Area. Pheasants again preferred to concentrate during winter in marshes and swamps (particularly in Pool 3) where dense stands of swamp rose, marsh mallow, and smartweed made ideal wintering habitat. Two grouse broods were seen, compared with one last year and three the year before. A brood of 12 was seen for several weeks south of Q-1. No quail broods were seen this year. Several hundred quail were reported to have been reared in pens and released just north of the Management Area on the Scaff property during previous years. Quail sightings were rare this year, although a small covey was reported near Fox Hunt Road in the early spring. The 25 game farm turkeys released on the refuge by sportsmen late in 1970 were reduced to about half-a-dozen birds by spring 1971. Horned owls, foxes and poachers accounted for most of the rest. Surprisingly, a brood of 12 poults was successfully reared a couple of miles west of the refuge. Another 22 birds were released in November this year, but only one of these was known to have survived until the year's end. She was herded into the company of a lone tom just south of the refuge by a few interested neighbors. At least nine of the birds in the brood west of the refuge survived until the end of the year.

C. Big Game Animals. The white-tailed deer is the only big game animal on the refuge. A lost black bear wandered through the area a couple of years ago, but was finally captured and moved by State personnel to keep it out of trouble.

The winter deer population was estimated at 430 as of December 31 and showed little fluctuation due to fairly mild weather conditions. In contrast, the population estimate for December 31, 1970, was 360. The 1970 wintering population exhibited greater fluctuation due to weather when deer started moving off the refuge in December. Only about half-a-dozen deer damage complaints came from local suburbia this year. The mild winter probably had a lot to do with this.

For more detailed information on the deer herd, see Section V-D-6.

D. Fur Animals. Our muskrat population continued at a high level of at least several thousand animals. The rats caused substantial damage to many of our small dikes and ditch plugs. We have not yet undertaken a formal census or control program.

Mink, weasels, opossum, skunk, and gray foxes are thought to be on the increase, based on the number of incidental sightings and road kills. One weasel was seen climbing the pole to the martin house at Q-1, drawn by the calls of a nest full of young starlings. Unfortunately it wasn't able to get from the pole into the house. The weasel was then seen checking a vacant bluebird house on a

nearby tree trunk.

The otter is listed as "endangered" by the State. There have been no confirmed sightings of this species in the refuge area in recent years.

With our progress in restoring water levels, raccoons have been dealt a sizeable increase in good habitat. At least a couple dozen raccoons were seen in the cavities throughout the refuge, and their tracks are everywhere.

Young red foxes were seen almost daily during the summer and fall in the Management Area. They provided many hours of public enjoyment, particularly along Pleasant Plains Road north of the office where one or more could be seen almost any summer evening catching mice in the adjacent fields.

Our problems with feral cats and free-running dogs were greatly reduced this year. Removal of old buildings may be helping the cat situation, but a few were dumped on the refuge to feed on the wildlife as usual.

E. Hawks, Eagles, Owls, and Crows. Due to heavy usage by wood ducks, the sparrow hawks were faced with a housing shortage this year. Only two nests were found in wood duck boxes compared with four last year. The others were found in boxes specially provided for the hawks in lone trees in large fields. Fall floods are thought to have substantially reduced our field mice and insect populations, and by the end of the year most of the sparrow hawks had sought greener pastures. This year a pair of red-shouldered hawks was successful in rearing two young (two other eggs didn't hatch) in a nest near the west side of the Wilderness Area. The young were banded by cooperative bander Bob Wilson just before they fledged. This species is listed as "status undetermined" by the State of New Jersey. There were no sightings of peregrine falcons, Cooper's hawks, or bald eagles this year. These species are listed as "endangered" by the State.

Great horned, barred, and screech owls are permanent residents. In November and December a saw-whet owl was observed at his traditional location in the cedars west of Pleasantville Road. A few ospreys were again seen during the spring and fall. This species is listed as "endangered" by the State. The manager's wife saw an osprey catch and eat a foot-long goldfish behind Q-1 during the fall flood. The National Audubon Society was interested in filming a great horned owl nest, but we were unable to locate one this year.

No eagles were sighted for the second year in a row. As many as five turkey vultures were present during the spring (feeding on necropsied deer at the Wildlife Observation Center). A few vultures were occasionally seen during the summer and fall.

F. Other Birds. For the fourth year in a row, the martins have failed to nest in our houses. Two new houses were added (total: four). Martins looked over at least three of them, but starlings discouraged them. The starling problem was finally solved by adding ceilings to the top compartments, but by that time the martins had also left, so we are patiently awaiting next spring.

Bluebirds were scarce again this year. This species is classified as "rare" by the State. Only a few pairs were seen, but a pair with several fledglings showed up at Q-1 in June and soon re-nested in a nearby box. Due to previous experiences with weasels and coons, we installed a predator cone on the mounting post, and another brood was successfully reared. Several more predator-proof boxes will be installed in the general area before next spring.

There were several sightings of loggerhead shrikes (new refuge species) by Mr. Gavutis and Miss Chapman during late summer. The first sighting was on August 15.

The Summit Nature Club conducted their annual Christmas bird count on December 26. Sixty-nine species were recorded within a 7½ mile radius of New Providence, which includes the refuge. At least 40 of these, including towhees, great blue herons, kingfisher, red-headed woodpecker and wood ducks, were on the refuge. The State lists the red-headed woodpecker as "endangered". As usual, there were several refuge sightings of this bird this year.

Short-billed marsh wrens and prothonotary warblers are classified "rare" and undoubtedly were present this year, but we had no verified reports.

G. Fish. Populations of Gambusia "mosquito minnows" stocked during the three previous years were greatly diminished by the spring of 1971. Possible factors include drawdown, winter kill, dispersal by flooding, and predation. The only ponds known to still have a good population of the minnows are at Q-1 and the former Harding Township dump. During the summer, several hundred Gambusia were transplanted from Q-1 to a dozen ponds elsewhere in the Management Area. Recurring flood conditions during the fall flushed many fish from secure habitats. As a result, many ponds lost most, if not all, of their fish. Gambusia minnows may have to be re-established in many ponds next year for mosquito control. Considerable carp spawning activity was noted in the flooded timber behind Q-1, and carp were also noted as far upstream as Woodland Road.

H. Reptiles and Amphibians. There was one unverified report of a bog turtle, which is on both the New Jersey and federal rare and endangered species lists, being seen in the Great Swamp this year. Prior to this there were at least four consecutive years without a positive sighting. Hopefully the restored water levels in the Wilderness Area will provide the habitat required for expansion, if a few bog turtles still remain. We are working with Dr. James Anderson of Rutgers University, Newark, to initiate a full-scale bog turtle inventory and possibly to transplant bog turtles into suitable habitat where they do not presently exist. The study will commence during the summer of 1972.

The blue-spotted salamander, classified as "endangered" by the State, is found only in the Great Swamp. This species should be benefiting from restored water levels. There was one sighting by refuge personnel this year - under a pile of bricks at Q-1.

There were several wood turtle sightings. This species is listed as "rare" by the State.

Approximately 20 snapping turtles were removed from various parts of the refuge this year.

The second positive identification of a pickerel frog in recent years was made this year. A single specimen was found on Tract 10q in the extreme eastern corner of the refuge.

I. Disease. None verified. Epizootic hemorrhagic was suspected in deer during the summer, when several deer were found dead in or near the water in the refuge area. The carcasses were too far decomposed to determine cause of death, and no further mortality was noted. The disease nearly wiped out the Great Swamp and North Jersey herd 15 years ago.

J. Insects.

1. Mosquitoes. Morris County again treated the perimeter of the refuge during April with Abate larvacide for floodwater mosquitoes. The Mosquito Commission also monitored light traps (one at refuge headquarters), but their monitoring seems to be becoming more and more haphazard. Mosquitoes were extremely abundant during the fall floods, right up until December.

2. Deer Flies and Ticks. These groups were normally abundant and pesky. It was noted that both deer flies and mosquitoes were conspicuous by their absence along the new boardwalk, but one only had to step into the grass or leaves to find they were still

nearby. We aren't sure whether the strong odor of freshly cut oak, the lack of disturbance to vegetation, or something else caused this phenomenon, but if it continues for another year, we may have found a cure for the summer biting fly problem at Great Swamp (and elsewhere).

3. Gypsy Moths. Defoliation in the northwest corner of the refuge peaked at least a year or two ago, but this year extremely heavy defoliation occurred throughout most of the rest of the refuge. Areas that were normally heavily shaded had no leaf canopy whatsoever. It looked like spring, and the droppings hitting the leaves sounded like rain. The boardwalk was covered with several inches of droppings and leaf particles. The increased sunlight greatly stimulated the understory vegetation, and there was a heavy influx of cuckoos preying on the hairy caterpillars. The New Jersey Department of Agriculture introduced a new parasitic wasp near the comfort station and conducted an investigation on parasitism. Most egg cases examined in December seemed to have been heavily parasitized, so the worst may be over.

III. REFUGE DEVELOPMENT AND MAINTENANCE

A. Physical Development. Unless otherwise noted, activities utilizing tractors and heavy equipment were accomplished by contract or open market purchase. Equipment was rented by the hour with operators, and time was kept with Government-owned Servis recorders.

Property Cleanup. In the Wilderness Area, nine buildings including two houses were either removed or destroyed and buried. Five hundred feet of an old wooden and wire fence was buried. Several trash dumps in the area were buried, and two dug wells were filled. One 18- by 12-foot bridge on Meyersville Road made of reinforced concrete was demolished. At least 19 small culverts and bridges in the Wilderness Area were removed, and 250 feet of an old asphalt driveway was ripped up and buried. A swimming pool and several old barns, outbuildings, and trash dumps in the Management Area were buried. All covered dumps and spoil areas were limed, fertilized, and planted to grass. The abandoned portion of Meyersville Road (approximately one mile) was planted to grass and rye. Several truckloads of litter were removed from the roads.

Water Control Facilities. The Pool 1 dike and road consumed most of this year's construction activities. Cadastral Surveyors Tornstrom, Ireland, and Damon and Engineer Bevilacqua from the regional office established land profiles, took core samples, and surveyed the Pool 1 dike and road during March. More than 2,000 trees and saplings (dbh - 2 to 3 inches) were removed from the sites

of the dike road and dike spillways. The road and 800 feet of the main dike were completed north of Great Brook by July. Although hampered by heavy rains and relatively high water, at least 30% of the fill needed for the main 1,500-foot section crossing the Great Brook marsh was in place by the end of August. The partial construction of the 200- and 100-foot spillways took up much of the remaining time; however, a 350- by 4-foot supply ditch with 40 feet of ACCMP and a water control structure were completed north of the 200-foot spillway. Two cement stop-log structures, the downstream slopes of the spillways, 25% of the upstream sides of the spillways, and a 400-foot section of the dike crossing Great Brook remain to be completed whenever it stops raining.

A 24-inch ACCMP and water control structure in the headquarters-to-Wildlife Observation Center service road was removed and replaced with an 18-inch ACCMP pipe and structure. A similar ACCMP and water control structure was installed in the Pool 1 road west of the former Harding Township dump. Approximately 20 plugs were made across old ditches to restore water levels to small swamps, marshes and ponds. One hundred and fifty feet of the No. 6 S&M ditch was dug, and 1/4 mile of ditch spoil was graded to slope, fitted, and seeded.

Roads. One and a half miles of road leading to the main Pool 1 dike was completed. Over 4,500 yards of gravel salvaged from the abandoned Meyersville Road was placed on the roads in the vicinity of Pool 1. An additional 700 tons of commercial crushed stone road mix was spread under contract on the roads leading to the Pool 1 dike. Another 600 yards of gravel salvaged from the abandoned Meyersville Road was spread on our service roads and driveways in the Management Area. Twenty tons of commercial crushed stone mix was placed on the driveway at Q-189. All roads and driveways were graded and leveled before the beginning of winter. A 75-foot turnaround was constructed at the end of Woodland Road adjacent to the Wilderness Area.

Fencing. Nearly 4,000 feet of boundary fence (3,000 feet of sheep fence) was constructed and three 14-foot pipe gates installed on the southeast side of Tract 10 adjacent to the Wilderness Area to eliminate access by mini-bikes and motorcycles. Most of the posts had to be cemented in due to the trap-rock roadfill along the boundary in that area. Sixty feet of the above fence was later rebuilt because of vandalism. Two 14-foot pipe gates were made and installed at the north entrance to Pool 1 and the entrance to the service road on Tract 247b north of headquarters. Eight cable gates were painted this year, and half-a-dozen new cable gates were installed.

Posting. A line 1/2 mile long south of the Observation Center was posted with 75 "closed area" signs to delineate the western boundary of the public use area. The boundary line of Tract 219d along Long Hill Road was posted with 17 signs. The boundary corners of Tract 10q were also posted.

Nature Trails. In the Wildlife Observation Center area, 77 feet of the existing boardwalk was repaired. A new trail was cut to the site of a new observation blind; 3,350 feet of the new 30-inch wide boardwalk was completed before the end of the year. A path was cleared for canoe launching at Great Brook just southwest of Pleasant Plains Road. A bridge, several signs, a leaflet dispenser and 500 feet of boardwalk at the Ground Pine Trail were removed to comply with the Wilderness Act.

Signs. The six refuge entrance signs were stained. Six plastic experimental "Wilderness Area" signs were installed at various locations. The effects of weathering and vandalism on the signs are being investigated. Ten signs were installed to provide information or to help control public use on the refuge. Several dozen signs (mostly blue goose) had to be replaced because of vandalism or theft.

Office. The exterior of the office building was painted, and several missing shingles were replaced. The deteriorated back landing and steps were rebuilt. The garage floor was sealed and painted, the garage was panelled, and a projection booth was installed to provide a lecture room.

Miscellaneous Buildings. Both the exterior and interior of the Information Booth at headquarters were painted. The concrete floor had to be painted twice this year because of heavy use by the public. The exteriors of the storage buildings and shops at headquarters were painted.

Quarters. The following is a list of the major jobs accomplished in refuge quarters:

Quarters 1. The exterior trim of the house and the living room, kitchen, hall, and two bedrooms were painted. The garage door was repaired, and three storm doors were replaced. A new water pump and a lightning protector were installed. A receptacle and transformer were replaced, and several repairs were made to the plumbing. Two maple trees, fifteen rose bushes, two azaleas, three gray birches, and three Colorado spruces were planted on the lawn.

Quarters 91. The house and garage, presently surplus to our needs, are under Special Use Permit to Morristown National Park for use by one of their employees.

Quarters 7. The side porch was rebuilt and painted, the trim of the house and garage were painted, and a lightning protector was installed. Two deteriorated culverts in the driveway entrance were replaced. Four forsythia bushes, five spruce trees, one apple tree, and twelve rose bushes were transplanted from Tract 223.

Quarters 151. A furnace salvaged from the house on Tract 223 was installed, and several repairs were made to the heating pipes. One thousand square feet of subflooring and tiles were replaced in the house. A small subterranean well covering was constructed and a new water pipe installed. Several electrical circuit repairs and renovations were made. The septic tank was pumped out. Rolled roofing was completed on an 18- by 35-foot section of the roof. The exterior of the house, the living room, the kitchen, and the den were painted. The garage and one outbuilding were also painted.

Quarters 189. The exteriors of the house and garage were painted. Later the shower was painted with a special waterproof paint. A new water pump, 80 feet of copper pipe, a water tank, and a lightning protector were installed.

Quarters 205. The exterior of the house was painted. The basement was sealed to prevent water seepage, and a new sump pump was installed. The sewage system was pumped out and leach lines were treated with sulphuric acid. The water pump control panel was repaired. Temporary repairs were made on the subterranean well house. The furnace had to be repaired several times. A lightning protector was installed. Eight bayberry bushes, three forsythias, four gray birches, eight spruces, and two multiflora rose bushes were transplanted from Tract 223.

Quarters 206. The trim of the house and the garage were painted this year. The septic tanks were pumped out, and a new field was constructed. Installations of a lightning protector, a new oil heater, and a refrigerator were completed. Two spruce trees from Tract 223 were transplanted near the driveway.

Comfort Station. Due to the burning of the original Wildlife Observation Center blind in 1969, the exterior of the comfort station was re-sided with Koppers exterior treated fire-resistant plywood and battens and then restained. Electric strikes wired to time clocks were installed on the men and women's room doors to lock and unlock them automatically each day. Two broken water pipes resulting from a faulty heater fan were replaced, and the electric heater was also repaired. The interior lights and exhaust fans were hooked into the timers to be sure they are off at night. An

ultrasonic alarm system was installed but proved to be too sensitive and undependable. Six bayberry bushes, three rhododendrons, four spruce trees, eight multiflora roses, four forsythias, and two red cedars were transplanted from Tract 223.

Equipment. A well pump and a sump pump used as standby units were repaired. The three-point hitch lift for the JD-350 bulldozer was rebuilt. A frozen drive housing on the lawn tractor was freed.

Minor welding repairs were made to the Case 7-foot rotary mower. The Case tractor's transmission was repaired and re-installed, and the magneto was replaced.

Major welding repairs were made to the housing and frame of the John Deere brush mower. A shear pin housing was replaced, and the P.T.O. yoke tube was straightened.

GSA Vehicles. Two new vehicles, an Ambassador sedan (full power and air conditioning - at GSA's insistence) and a Chevrolet pickup truck, replaced the Ford sedan and the Dodge pickup truck. An old Plymouth sedan was added to the fleet to aid in the summer work program. The Plymouth was returned at the end of the summer.

New Equipment. The following items were purchased this year: a two-way radio base station, one portable two-way radio, a zoom Balscope, a projector screen, two metal desks, a horizontal file cabinet, and a heavy duty paint sprayer.

Nesting Devices. A total of 107 wood duck boxes were available from last year for use this year. Forty-eight single units and 28 double unit wood duck boxes were added this year. An additional 52 fiberglass or hardware cloth nesting cones for mallards, geese and black ducks were installed this year. The addition of the above cones made a total of 102 "other" waterfowl nesting devices available this year. Eight bluebird boxes were attached to wood duck boxes this year. Twelve members and two leaders of a local 4-H Club cleaned most of our 50 bluebird houses this year.

Traps and Other Trapping Devices. Five 10-foot long by 4 feet high by 4 feet wide plywood, modified New York State-type deer traps were built this year. A cannon net and associated equipment for deer, waterfowl, and dove trapping were procured. Two woodcock traps with leads were built.

B. Plantings.

1. Aquatic and Marsh Plants. Several acres of exposed mud flats

on Middle Brook and near the parking lot at the Wildlife Observation Center were seeded with 300 pounds of Japanese millet. Excellent growth was noted along Middle Brook, but the mud dried at the W.O.C. before seeding, so results there were only fair.

2. Trees and Shrubs. In the Management Area, 2,000 multiflora rose bushes, 1,000 Norway spruce trees, and 100 honeysuckle bushes were planted to provide more habitat diversity and to help delineate public use boundaries.

3. Upland Herbaceous Plants. Two pounds of partridge pea (Cassica fogiculata), which is an experimental Soil Conservation Service seed, was planted in the Management Area.

4. Cultivated Crops. Ten acres of food patches were treated with 15 tons of lime, 1.5 tons of fertilizer, and planted to grass and/or winter rye. An additional 19 acres of grassland was limed (25 tons) and fertilized (2.5 tons). Old house sites, dump sites, dikes, ditch plugs, culverts, and access roads were planted to reed canary grass, timothy, orchard grass, clover, rye, millet or oats.

C. Collections and Receipts.

1. Seed or Other Propagules. None.

2. Specimens. Two sparrow hawks, a mourning dove, a great blue heron, a yellow-shafted flicker, a green-winged teal, and a downy woodpecker were donated to Somerset County's Lord Stirling Park in Basking Ridge. Three mallards, a yellow warbler, a yellow-bellied sapsucker, and a sharp-shinned hawk were donated to the Scherman Audubon Sanctuary in Bernardsville.

Despite several weekends of searching, we were unable to locate any black duck or woodcock eggs for the Patuxent Research Station's pesticide analysis study.

D. Control of Vegetation. A local farmer mowed 169 acres of brush, goldenrod, and thistle at various locations throughout the Management Area. Over 1,000 2- to 16-inch red maple saplings in old brush-mowed fields on Tract 234 were cut with chain saws to actuate a lower transitional succession in the fields. The refuge provided lawn care at headquarters (2 acres), Q-1 (2 acres), Q-7 (.6 acre), Q-205 (1.3 acres), and Q-206 (1 acre).

E. Planned Burning. None.

F. Fires. None.

IV. RESOURCE MANAGEMENT

A. Grazing. None.

B. Haying. Louis Hinds, Jr., cut 2.3 acres on Tract 247 and paid $11.50. H. W. Schafer cut 45 acres and paid $187.50.

C. Fur Harvest. None.

D. Timber Harvest. None.

E. Commercial Fisheries. None.

F. Other Uses. Bee-keeper Eric H. Schoelpple paid $10 for keeping 10 hives of bees on the refuge.

V. FIELD INVESTIGATIONS AND APPLIED RESEARCH

A. Transplants. None.

B. Mosquitoes. The Morris County Mosquito Extermination Commission again treated a portion of the refuge with Abate (see Pesticide Report appended).

C. Gypsy Moths. The area gypsy moth infestation continued to engulf the Great Swamp, and after this year's siege, most tree trunks had at least one egg mass in preparation for next year. Although some hard-hit trees will undoubtedly die, we feel there is no need for concern, at least on the refuge since dead trees are good wildlife habitat and so is the regrowth that follows. Local conservation groups continue to battle the N. J. Department of Agriculture and some local landowners over the use of "Sevin". Biological controls are expected to curb the infestation in the Great Swamp area within the next year or so.

D. Wildlife Management Studies.

1. W.M.S. GS-2. "Transport of Viable Algae and Protozoa by Semi-aquatic Insects (A comparative study of in-flight transport of viable algae and protozoa by related species of Odonata and Hemiptera in the Great Swamp National Wildlife Refuge, the Pacific Northwest, and Texas)". The final field work of this study was to be conducted in the Great Swamp during the spring and summer of 1970. A final report was due on December 1, 1970, but has not yet

been received. The investigator advised he planned to complete his report by 1972.

2. W.M.S. GS-4. "Preliminary Studies on the Abundance and Distribution of Small Mammals of the Great Swamp" was terminated with few results because the investigator found he didn't have sufficient time to spend. This is just one of several Wildlife Management Studies we wasted considerable time and effort getting outlines, reports, etc., for, only to have the study go inactive or be terminated.

3. W.M.S. GS-5. "Ecological Study of Amphibian and Reptile Populations of the Great Swamp National Wildlife Refuge". This study was initiated on April 16, 1969, by Dr. James Anderson of Rutgers University. Work was begun on correlating air and water temperatures to the breeding sequence of the amphibians on the refuge. The blue-spotted salamander, Ambystoma laterale, common in the Great Swamp but thought to be found nowhere else in New Jersey, was found in ponds immediately adjacent to the refuge, and plans for transplanting eggs and larvae into a pond on the refuge were presented. Quantitative studies of amphibian egg densities, rate of development, and physical factors affecting amphibian eggs were conducted. Quantitative studies of larval density, mortality, spacing, movements, growth, length of larval period and dynamics were conducted. The last progress report was for 1970; 1971's report has not yet been received.

4. W.M.S. GS-6. "Arthropod Populations, Distribution, Systematics and Biology in the Great Swamp". This study was initiated on March 13, 1970, by Dr. Ivan Huber of Fairleigh Dickinson University. It was terminated this year because the investigator lacked time to conduct it.

5. Restored Pond Study. The study was initiated in the fall of 1968 by Dr. Louise Bush of Drew University. It was inactive since the summer of 1969 but was activated again during the fall of 1970. The purpose of the study is to observe the changes in aquatic fauna as a restored pond enlarged and matured to permanent status. During its first year, the restored pond was too unstable to show any correlation between physical factors and fauna. The report of 1970's findings has not yet been received, and as far as we know the study was inactive during 1971.

6. W.M.S. GS-9. "A Study of the White-tailed Deer in the Great Swamp National Wildlife Refuge." Increasing browse damage on and in the vicinity of the Great Swamp National Wildlife Refuge in

Morris County, New Jersey, prompted an attempt to interpret home ranges; seasonal movements and population fluctuations; physical condition and productivity; vegetational composition of range; degree and significance of annual forage utilization; and carrying capacity. Recommendations for habitat improvement and population control measures could then be based on factual data.

New Jersey Biologist Bob Lund made a helicopter deer (Odocoileus virginianus) count on January 20. He tallied only 65 deer in the refuge Management Area. We feel his low count was due to a lack of knowledge of refuge boundaries, spending inadequate time (only an hour or so) over the Management Area, and the fact that most deer seemed to have moved completely off the refuge due to weather conditions. A road count conducted on the following day by refuge personnel tallied 80 deer.

In March and April when food was relatively scarce, five box traps (modified after New York State Conservation Department traps) baited with whole apples and apple mash (compliments of local cider mills) were used to capture deer. A CO_2 dart gun, only accurate up to 25 yards, was also occasionally used at bait sites. Succinylcholine chloride (powder form) in preloaded darts was used as an immobilizer (source: Pneu-Dart, Inc., Post Office Box 388, Williamsport, Pennsylvania 17701). Nineteen deer were sacrificed for necropsy during March and April, and four were tagged and released.

A modified .32 gauge Harrington & Richardson shotgun utilizing .22 caliber blanks was used extensively during the fall, especially at night. It has a range of 100 yards and is accurate at 60 yards. Thirteen deer were immobilized with this gun, tagged, and released during November and December 1971.

Each of the five deer traps weigh about 500 pounds, and the holding box 115 pounds. Since we were unable to move traps into the Wilderness Area with a vehicle, most of the trapping was done in the Management Area. Fortunately most deer wintered in the Management Area. Numbered monel cattle ear tags and colored plastic ear streamers were used to mark the released deer. Future sighting and recovery records will supply movement and population data.

Box trapping success during the period March 3 to April 8 was comparable to that experienced by the State of New Jersey in poor deer range: an average of 9.3 trap-nights per deer. The winter of 1970-71 was relatively mild, and the Great Swamp range was felt

to be significantly in excess of the safe carrying capacity. The average body weight of refuge deer was 15.4 pounds less than New Jersey deer on "good" range, and 1.6 pounds heavier than New Jersey deer on "poor" range. Three body indices indicated that body fat reserves were depleted in fawns.

A dead deer survey covering four blocks totalling 511 acres of winter range in the Management Area was conducted on March 23. A total of 14 state and refuge personnel participated, and no deer that had died during the previous six months were found.

Necropsy examinations of 19 deer taken on the refuge during the period extending from March 3 to April 8 revealed 100% of the 10 adult females gravid. None of the seven doe fawns were gravid. Out of the 18 fetuses, 61.1% (11) were male and 38.9% (7) female. This gives a male-female ratio of 3 to 2. There were six incidences of twins and one of triplets.

Production was slightly over one fawn per doe, and the fawn crop was estimated to be 230. Failure of fawn breeding and the high percentage of male fetuses of older does tend to indicate a deer range in poor condition.

In conjunction with the late winter necropsies, the rumen contents of 10 adult does and 7 fawns were subjected to a point-frame analysis in order to determine diet composition. Grass was the most frequently used vegetation. It made up 36% of the diet of adult deer and 19% of the diet of fawns. Woody twigs, primarily red cedar (60%) and red maple (40%) made up 27% of the diet of adult deer and 19% of the diet of fawns.

Fourteen fawns were hoop-netted, hock-streamered, and ear-tagged during the period of May 27 to June 7. Two of these fawns were recaptured the following fall. At the time of recapture, one was missing one of its soft metal ear tags, and both were missing their plastic hock streamers. At least a few fawns did retain their streamers until the year's end, and most probably retained at least one ear tag. Tougher tags made of "monel" will be used next year.

Deer exclosures will be constructed next year to analyze the effects of deer on the vegetation and to determine the actual carrying capacity. Other plans for 1972 include a helicopter deer count made by refuge personnel; road counts; a trapping, immobilizing, and tagging quota of 30 deer; necropsy quota of 20 deer; fawn capture and tagging of 20 deer; and a dead deer survey.

E. Research Natural Area. Nothing new to report on the 746-acre M. Hartley Dodge Research Natural Area.

F. Wilderness Area. Mini-bikes continued to be a serious problem, and sturdy and constantly maintained fencing and gates in high problem areas seem to be the only answer. Some snowmobile trespass was also noted.

The lower two-thirds of Meyersville Road, which bisects the Wilderness Area, was formally abandoned by Passaic Township on December 11, 1970. Temporary barricades, gates, and turn-arounds were constructed, and all man-made structures including the roadbed were removed from the closed portion by summer. Plans have been made to use Land and Water Conservation Fund money to acquire additional land on the east side of Meyersville Road just south of the Wilderness Area. This land would be used to provide a buffer for the Wilderness as well as boundary access, a permanent turn-around, parking, interpretive facilities, and possibly sanitary facilities. Other information concerning the Wilderness Area has been incorporated throughout this report.

G. Banding. A total of 411 birds of 11 different species were banded on the refuge in 1971.

1. Canada Geese. Seventeen geese, primarily goslings, were captured by driving and were banded.

2. Ducks. Ducks banded included one green-winged teal, 11 black ducks, 61 mallards (including one black and mallard crossed duck), and 209 wood ducks. Although most of the ducks were caught in welded wire lilypad traps, a few were caught in floating wire traps. The refuge again filled the State's preseason quotas for "local" and "other" wood ducks. It appears that a high percentage of our black ducks are being taken during the hunting season.

3. Mourning Doves. Only 69 doves were trapped this year due to the fact that the State of New Jersey was contracted to band the state preseason quota of 500 doves. Our dove banding was done strictly on a volunteer basis.

4. Woodcock. Ten woodcock were banded during the summer after capture by nightlighting. Equipment used was (1) a four-wheel-drive truck, two or three 12-volt spotlights, a large long-handled net, and (2) standard shore bird traps with leads. Narrow 8- to 10-foot strips mowed in grass and weed fields aided in concentrating the birds and thus greatly reduced time spent finding them. Despite only 31 woodcock bandings in the past couple of years, we have had six returns (19%); this compares with 5% returns in a study by Patuxent.

5. Hawks and Owls. Ten sparrow hawks, two red-shouldered hawks, and 20 screech owls were banded by a cooperator. Most of the sparrow hawks and screech owls were captured in our wood duck boxes.

VI. PUBLIC RELATIONS

A. Recreational Uses. Nearly 97% of our recreational use was in the "wildlife oriented" categories of wildlife observation, photography, nature study and hiking. Four areas were open to the general public: the headquarters area (Information Booth and 1/4 mile Waterfowl Management Trail), the Wildlife Observation Center (observation-photography blind and 3/4 mile trail), the Ground Pine Trail (3 miles), and the Laurel Trail (3 miles). The latter two trails are in the Wilderness Area.

The estimated number of refuge visitors during 1971 was 141,300, compared with 130,600 in 1970, 105,100 in 1969, and 33,324 in 1968. The low increase during the past few years has been due to the fact that our existing facilities have reached capacity during the peak use period on Sunday afternoons during spring and fall. The Waterfowl Management Pen near headquarters is being phased out, and so are the boardwalks, signs, parking lot, outhouses, bridges, and other man-made facilities at the Ground Pine Trail in the Wilderness Area.

The station was manned on weekends during the fall to provide improved service to the public when there was substantial visitor use. During spring and summer, most of the staff worked on systems objectives, and our guided tours, slide talks, and weekend work were curtailed.

Approximately 62,000 people used the recently expanded facilities at the Morris County Outdoor Education Center which has portions of its entrance road and one-mile nature trail on refuge property. A great deal of the demand for guided tours is being met by the Center, which gives weekday classes to school groups and regularly scheduled guided tours on weekends during the spring and fall.

The 600-acre Somerset County Lord Stirling Park carries out outdoor education programs adjacent to our western boundary across the Passaic River. During spring and fall 2,000 children participated in their programs each month. This winter 800 to 1,200 children per month were involved. Eight and a half miles of trail have been completed, and a $150,000 matching funds grant from B.O.R. has been given for ponds, boardwalk, and other site development which is expected to commence next year.

The National Planning Team visited the refuge with their interim report and five planning alternatives. Discussion with the refuge and Regional Office staff produced a sixth alternative which is a composite of those features that were thought best.

In accordance with the National Planning Team recommendations, we have been planning to phase out visitor use at the headquarters Waterfowl Management Pen on Pleasant Plains Road and are emphasizing use of the Wildlife Observation Center adjacent to Long Hill Road. One mile of boardwalk trail leading to the observation blind site and returning to the parking area was nearly completed. The new observation blind is 90% complete. It is a steel structure donated by the Garden Clubs of Summit and Somerset Hills. These clubs had donated the original blind which was destroyed by fire in 1969.

A total of 45 free-use permits were issued this year for entry into portions of the refuge not open to the general public. Most of these were for birding, nature study, and photography in the Woodland Road and the south end of Meyersville Road portions of the Wilderness Area. Several permits for use of both the Management and Wilderness Areas were given to the Summit Nature Club for the annual Christmas bird count and for the first-of-the-month censuses taken during the first week of December, January, February, and March.

Twenty-two permits were issued for canoeists to use the two parking spaces available while canoeing along our boundary downstream from Pleasant Plains Road on Great Brook and the Passaic River.

We had several school groups visit the refuge without benefit of a guided tour or introduction to refuge regulations. After finding three buses with 120 shrieking children at the Observation Center in May, we introduced the system of reservations and bus permits.

B. Refuge Visitors. Numerous Regional Office personnel visited us during the year, including Messrs. Horn, Woon, Reese, Ogden, Yaw, French, Suich, Wise, Tornstrom, Ireland, Daigle, Peer, Pfeiffer, Catalanotto, Stone, Anderson, Dalley, Reckeweg, and Bevilaqua.

Other Bureau visitors included Bob Nelson, Bombay Hook; George Gage, Target Rock; Gaylord Inman, Joanne Smith, and Jack Filio from Brigantine; and Game Agents Brown and Greenwald from Trenton.

Messrs. DuPont, Phipps, Harry, and Robinson of the National Advisory Board toured the refuge briefly on October 26 and discussed refuge operations and objectives.

Bureau of Outdoor Recreation officials from Philadelphia, Messrs. Hanolly, Jones, Lawson, and Donaghue, visited the refuge to discuss our recreational use plans and the status of the Corps of Engineers' Passaic River Flood Control Plan.

The Director of the New Jersey Department of Fish, Game and Shellfisheries, Russ Cookingham, visited the refuge to discuss the deer management study. New Jersey Biologists Bob Lund, George Howard, and Bob MacDowell and Conservation Officer Harold Chitwood made numerous visits throughout the year.

Several visits were made by the surrounding county park directors to discuss cooperative public use programs and for group efforts in solving local problems. These officials included Messrs. Russell Myers, Morris County Park Commission; Joseph Hovance, Morris County's Outdoor Education Center, which borders the refuge on the east; Jack Moody, Somerset County Park Commission; Walter Jones, Somerset County's Lord Stirling Park, which borders the refuge on the west.

We also had several visits from Dave Moore, Executive-Director of the North Jersey Conservation Foundation, primarily related to land acquisition.

Consultation services were provided by Messrs. Sauer, Vidrine, Klotz, and Bockhoven of the Morris County Soil Conservation Service on their visits to the refuge.

Messrs. Phil Barske, Wildlife Management Institute, and Jim Johnson, National Wildlife Federation, Washington, D. C. stopped by on separate occasions to discuss the deer situation at Great Swamp.

Mr. Bill Curtsinger photographed parts of the Wilderness Area for a book by the National Geographic Society.

On December 2 Superintendent Lewis and Ranger Fauber of the Morristown National Historical Park stopped by to discuss coordination of crowd control operations.

C. Refuge Participation. Forty-five tours, sixteen slide talks, five conservation projects, and two displays (at the Morristown Library open house, and at the Newark Museum for 2 or 3 months beginning in December 1971) were presented to the public. Assistant Manager Mitchell was a member of and participated on the Conservation Advisory Committee on the Wildlife Subcommittee for Schiff Boy Scout Reservation.

Television. The refuge appeared briefly in an hour-long NBC special on Pribiloff seals. Deer management on the refuge and the unsuccessful attempt to hold a deer hunt were discussed.

Newspapers. Although we submitted only three news releases during 1971, 117 known newspaper and magazine articles appeared with an estimated 1,260 inches of newsprint. The largest number of articles were printed in the beginning of the year due to the deer hunt controversy the previous fall.

Other. On January 16, 350 area Scouts participated in the fourth annual Totem Trail held on the refuge. The Scout troops took part in the field day by dragging a homemade supply sled around a 1½ mile course, stopping at points along the way to compete in compass reading, first aid, signalling, knot-tying, and fire building. At least 600 spectators were on hand.

On April 30 the New Jersey Audubon Society sponsored a lecture and frog walk. The Outdoor Education Center was the site of the lecture, and the Wildlife Observation Center was the site for the "walk". One hundred fifty people were planned for and accommodated on the walk, and five hundred were turned away. We will probably plan to hold frog walks on our own sometime in the future.

D. Hunting. The Humane Society's suit and restraining order that halted the deer hunt planned for December 1970 had still not been settled in court as of December 31, 1971. An attempt was made to add two Region 4 refuges to the suit this year, but this was denied by the new Federal District Magistrate in Washington, D. C. We understand that the Humane Society's lawyer now keeps postponing the hearing. If he does so for much longer, there will not be adequate time to plan for a hunt in 1972 even if the court rules in our favor.

E. Violations. Night hunting violations (deer) increased markedly this year, with at least a half dozen incidents coming to our attention. The deer herd publicity was the most probable reason. Several apprehensions were made, and two .22 rifles discarded in haste in a roadside ditch were turned over to Harding Township police. No incidents were reported the previous year. Considerable illegal deer hunting was also likely during the state deer season (one paunch and several spent shells were found).

We seem to be gaining in our struggles to eliminate mini-bike use in the Chatham Township area. Sturdy pipe gates and sheep fence seem to be doing the trick as long as we keep them maintained. Trespass into restricted areas along Pleasant Plains Road was greatly reduced by installing signs asking visitors to stay in their cars so others would have wildlife to see.

Several other "late shooting", "hunting on refuge", "unplugged gun", "out of season", "no license", "someone else's license" type cases were made in and adjacent to the refuge.

F. Safety. Formal monthly safety meetings encouraged staff participation in identifying and correcting safety hazards. Frequent informal discussions made the work crew familiar with possible hazards associated with planned work projects. Vehicles and buildings were periodically inspected and safety hazards corrected.

No accidents occurred during the year, and as of December 31, 694 days had gone by without any accidents reported and 694 days without any lost-time accidents.

All permanent personnel have successfully completed the National Safety Council's Defensive Driving Course.

Drinking water samples from occupied refuge buildings and the comfort station were tested at the Lyons Veterans Administration Hospital.

VII. OTHER ITEMS

A. Items of Interest.

1. Land Acquisition. As of December 31, acquisition of title had been completed on approximately 5,300 of the 5,800 acres approved for acquisition. Progress increased considerably this year due to the fact that declarations of taking were filed on several tracts totalling several hundred acres (Wildlife Preserves, Inc). Much of this land was donated to Wildlife Preserves many years ago with the mistaken belief that it would automatically become part of the refuge. Now much of the land is valued at up to $5,000 per acre, and it looks like we are going to have to pay the price.

2. Training. The following training was completed by members of this station.

Date	Course	Location	Personnel
1/25-29	Wing-Bee	Patuxent	Delaney
2/1-5	Woodcock Wing-Bee	Patuxent	Delaney
2/18	NSC Defensive Driving	Lamar NFH	Roscoe
4/16	DIPS Workshop	Boston	Penn
4/21-23	Law Enforcement Training	Montezuma NWR	Delaney
4/21-23	Systems Workshop	Great Swamp	Gavutis
5/4,11,18,25	NSC Defensive Driving	Plainfield	Bagley
7/28	NSC Defensive Driving	Lamar NFH	Bell
7/28	NSC Defensive Driving	Lamar NFH	Cole
7/28	NSC Defensive Driving	Lamar NFH	Flanagan
8/27-9/5	Interpretive Training	Chincoteague	Chapman
10/5-8	PPBE Systems Workshop	Boston	Gavutis
10/5-8	PPBE Systems Workshop	Boston	Mitchell
10/5-8	PPBE Systems Workshop	Boston	Delaney
10/7-10	PPBE Systems Workshop	Boston	Penn

3. Personnel Notes. Doug Roscoe of New Vernon, New Jersey, started work on January 11 as a temporary Laborer. He had previous experience working summers at Morristown National Park and the New Jersey Division of Fish and Game. He had received a B.S. degree in zoology at the University of Wyoming. Doug was converted to a Biological Aid effective May 18 and worked primarily on our deer study and banding program. He resigned effective September 3 to return to school (University of Connecticut) to work on his Master's Degree.

George Bagley joined the staff on March 8 as a Maintenance Worker. He was previously self-employed in landscape and paving work. He resides with his wife Anne Marie and their four children adjacent to the refuge in Chatham.

The Tom Mitchells added a new member to their family on March 13, a daughter Megan. In May the Mitchells left for a month's vacation in Colorado. Tom resigned from the Bureau in January 1972 to work with his father-in-law at a winery in New York state.

George and Sandy Gavutis added another member to their family, Gregory Ellis. He arrived May 10, just in time for brother Georgie's fifth birthday.

Refuge Manager (Trainee) Herb Bell entered duty on June 27. Herb has had considerable experience including two years as a Tennessee State Game and Fish Officer and has about completed work on his Master's Degree. He and his wife Carolyn and their 5-year-old son Timmy are living in Q-151.

Bob Delaney was promoted on August 21 to Refuge Manager, GS-7, and then transferred to Iroquois Refuge in October. Bob started here in July 1970 as a Refuge Manager Trainee.

Bill Koch was hired on December 27 as a Refuge Manager (Trainee) on a one-year appointment. Bill received his B.S. degree in wildlife management at the University of Maine. He worked last summer as a Biological Aid at Brigantine Refuge on the Holgate Unit.

Mr. Gavutis spent February 4 in the Regional Office participating in a public use discussion with the National Planning Team and several Regional and Central Office personnel.

The New Jersey Employment Service in Morristown selected Diana Batlas, Maury Mills, and Don Weston as our Summer Aids. Diana assisted Clerk Anita Penn with typing, photocopying, and other office duties, while Maury and Don performed maintenance tasks such as lawn mowing, office cleanup, and painting and repairing buildings.

4. Other. A $37,636.10 Revenue Sharing check was presented to Morris County on October 29. The three local townships in which we are located have thus far been unsuccessful in getting any of the money back from the county. The townships are now sponsoring special legislation in an attempt to get the funds for local schools and road maintenance.

In addition to portions of Meyersville and Woodland Roads in the Wilderness Area, we asked Harding Township to abandon 1½ miles of Pleasant Plains Road. This road bisects our Management Area, and since it is flanked on both sides by government property, it has been allowed to deteriorate badly. Because it is a lightly travelled public thoroughfare, we are regularly bothered by night-time visitors performing the full gamut of "non-conforming" uses. If the township decides to abandon the road, we would take over the maintenance, make it a dead end at refuge headquarters, and install gates at either end to be locked at night and possibly on weekends when the office is closed. Meyersville and Woodland Roads have now been completely abandoned by the townships, but opposition by one local farmer has held up the decision on Pleasant Plains Road thus far.

5. Credits. Preparation was as follows.

Refuge Manager George Gavutis	Sections I; II; V (except D-6 and G); VI-D,E,F; VII; photographs and editing.
Asst. Mgr. Tom Mitchell	Photographs.
Asst. Mgr. Herb Bell	III; IV.
Asst. Mgr. Bill Koch	V-D-6, G.
Public Use Spec. Beth Chapman	VI-A,B,C.
Clerk Marsha Verderber	Typing and assembly.

6. NR Forms. Appended.

B. Photographs. Appended.

Reviewed by:

Howard E. Wilson
Regional Refuge Supervisor

Date

Submitted by:

G. M. Gavutis Jr.
Refuge Manager

6/1/72
Date

NR's checked in Regional Office by: HC

Regional Director, Boston (RF) September 8, 1971

Refuge Manager, Great Swamp NWR
Basking Ridge, N.J.

Damage From Tropical Storm Doria - Great Swamp

The following is a brief description of flood damages incurred to physical structures on the refuge as a result of the record 10½" rain fall of August 27-28 as per phone conversations on 8/30 and 9/3. The damages are expressed in dollars necessary to replace and/or repair the facilities. This information is supplied to you in case flood damage money might be justified and applied for.

Damages to Pool #1 dike and road

A) Partial loss of earthen fill across Great Brook Channel....$150.00

B) Loss of road fill and gravel along old Harding Township dump road..... 200.00

C) Loss of earthen fill along portion of partially completed Pool #1 dike south of Great Brook..... 500.00

Total: $850.00

Numerous other damages, none of the individual magnitude of the above but substantial when totaled, also occurred. Extra vehicle maintenance, repacked wheel bearings, transmission and rear-end checks, etc., due to operating in high water, brief flooding of 3 resident water systems, removal of small amounts of earthen fill from numerous small ditch plugs and dikes and complete flooding of 6-8 acres of recently planted limed and fertilized winter rye.

Total cost to this station will be at least $1,000.00-1,500.00.

GREAT SWAMP'S HISTORIC FLOOD

4.75" rain - 8/27/71
5.75" " - 8/28/71
10.50" - Total in 18 hrs.

Saturday
8/28/71

Rain stopped and clouds moved away.

6:15 AM -Water 10' away from Q-1 well

7:15 AM -Water from Passaic River (¼ mile west) past southerly-most driveway at Q-1 on Pleasant Plains Rd. and flowing around both sides of house towards Great Brook bridge.

6:45 AM -Water going in Q-1 well overflow rising at least 12"/hour.

7:20 AM -Water 6-8" over road between Q-206 and sharp bend in road 150 yds north.

7:30 AM -Water 1' deep over maintenance road by Goose Pen flowing upstream (northeast) towards Great Brook instead of Middle Brook.

7:40 AM -Water 4" deep over maintenance road just east of old shop flowing upstream (northeast) towards Great Brook instead of Middle Brook.

-Water 6-12" deep over old maintenance road to blind - rest of road above water (including new blind bypass to Pool #1 Road).

-Some water flowing east across road just north of junction with bypass.

-Water 30' wide, 1-2" deep across proposed 200' spillway site for Pool #1.

-Water 6" above top of nail TBM #6 (229.64) = 230.14 (south end of dike across Great Brook marsh on downstream side).

-Water 3" below bottom of lath TBM #7 = 230.40 (below dike 300' north of south edge of Great Brook marsh).

-Water gushing through 400-500' open Great Brook marsh south of Great Brook where no dike fill had yet been placed.

-Water appears 1' higher (231.40) on upstream side of dike (this would be approximately 2' above maximum pool design level and equal to minimum finished dike and road elevation).

-Essentially all of Pool #1 road and dike still above water - some of dike fill estimated at 1' above final grade is 1'+ above water.

-Water 100'+ wide going over proposed 100' spillway site for Pool #1 (up to 6" deep) - <u>slight</u> current to south (towards Middle Brook).

-Water 35' wide, 6" deep east of proposed 100' spillway site.

-Water 250'+ wide across road in front of old blind (Middle Brook), 6" below top of structure, possible slight flow <u>upstream</u> (to north).

8:15AM - Water completely covering most of Pleasant Plains Rd. south of Q-7.
- 2" water over brass cap - Middle Brook - Pleasant Plains Rd. 229.31 + 229.5 (approximately).
- 75' water north of Middle Brook dike and 50' south of dike. Need at least 150' of emergency spillway here at 229.5 or lower to take care of water from proposed 100' Pool #1 spillway and runoff from several hundred additional acres of swamp woods and fields.
- Water 15" below top of control structure (Middle Brook at Pleasant Plains Rd.).
- Water at least 8" higher above Middle Brook dike (231.1).

8:40AM - 6"+ over north east bridge abutment Great Brook-Pleasant Plains Rd. (BM + 229.64 + .5 - 230.14 - same water level as just below Pool #1 dike on south end at 7:40 AM).
- 6"+ average water over entire Pleasant Plains Rd. - Great Brook to beyond north refuge boundary.

8:45AM - Iron handle all that shows of Q-1 well.

9:30AM - Water has risen another couple inches at Q-1 but slowing down.

12:30PM - 300'+ water across Long Hill Rd. - 4-6" deep both sides of first bridge north of W.O.C.
- 100'+ water across Long Hill Rd. - 4-6" deep north of second bridge north of W.O.C.
- Water backed onto road (over 1/3 of downstream or west side at both bridges) but strong flow across to west - still rising.
- Water at second bridge just barely clearing bottom of bridge - 231.4 - same as just above Pool #1 dike at 7:45 AM.
- Water 50' wide across Long Hill Rd. - both sides of third bridge north of W.O.C. - shallow.
- Water across 2/3 of Long Hill Rd. 50' south Great Brook - still rising.
- Water over top of I beam on west side of Great Brook bridge + 230.23 + 16" - 231.68.

1:00PM - Water across Woodland Rd. to 50' south of Montel Packie's driveway or just about at refuge boundary.
- Great Brook - Woodland Rd. 500'+ over road - not backed onto road on downstream (swamp) side - 6-12" deep over road. Neighbors claimed it had been nearly 1' higher earlier and was completely over road and bridge.
- Water standing in road 30' south of Mr. Stoddard's driveway on Meyersville Rd. north of refuge boundary.

1:15PM - Water at or slightly below peak according to Mrs. Weisgerber. 6" over BM at Loantaka Brook - Meyersville Rd. 237.99 + 6" - 238.5. Mrs. Weisgerber said her cellar and furnace were flooded.
- Water mark on trees indicated possible maximum drop of 5-7" at Loantaka Brook at Meyersville Rd.
- Tiehenor Ditch water .55 below BM (238.19 + .55 - 237.64 - evidently peak or still rising).
- Mr. Trapp said highest in 40 years, may get higher yet.
- Water in Trapp's cellar - only second time.
- Bridge reportedly washed out on Blue Mill Rd.

6:00PM - BM+4 north of Q-1 - water 2"+ above 231.13 = 231.3+ = approximate crest.

Sunday 8/29/71

10:00AM - Water 15" over wing wall - Great Brook/Pleasant Plains Rd. = 229.64 + 1.25 - 230.89 (had been 2"+ higher) = 231.05 approximate crest.
- 20' wide water crossing road south of Great Brook bridge on Pleasant Plains Rd.

11:00AM - 100'+ wide water flowing east to west across Long Hill Rd. just north of south refuge boundary and south of refuge sign (entrance).
- 40'+ wide water flowing across Long Hill Rd. east to west between Borako and Quick life use reservations - towards W.O.C. parking lot.
- Second bridge north of W.O.C. on Long Hill Rd. - water almost level with top of pavement on upstream (east) side - 231.24 + 16" - 232.7. Had been at least to top of I beam on west side - 232.6 as indicated by duckweed, etc.

11:30AM - Great Brook bridge, Long Hill Rd.:
230.23 + 19" - about 3" over top of I beam on west side - = 231.8. Had been 6"+ over top of I beam on west side - 230.23 + 22" = 232.0 - according to duckweed.

12:00 NOON - Black Brook/New Vernon Road:
Water 6" below pavement on bridge - had been higher (at least 6").
- Water 41" below top of cement abutment in SE corner - (232.75). Reportedly 20" deep on road south of bridge at 9:00 AM.

Passaic River at White Bridge Rd.:
10" below BM 230.78 (229.65). Neighbors said it was as high as has been - still rising.
- 18"+ water in Pleasant Plains Rd. just north of intersection with White Bridge Rd.
- 20"+ water in White Bridge Rd. west of Mill Ridge Club.

Monday 8/30/71

10:00AM - Water 1" below bottom of lath TBM #6 (south end Great Brook dike - below dike) - 230.9. Had been 7"+ higher = 231.5.

Historic Flood - Late Aug - 1971?

U.S. DEPT. OF THE INTERIOR
BUREAU OF SPORT FISHERIES AND WILDLIFE

in the GREAT SWAMP
NATIONAL WILDLIFE REFUGE
Extent of Peak flooding across roads
~~PUBLIC HUNTING MAP~~

3-1750
Form NR
(Rev. March 1953)

WATERFOWL

REFUGE Great Swamp NWR MONTHS OF January TO April, 1971

(1) Species	(2) Weeks of reporting period									
	1/1-7	1/8-14	1/15-21	1/22-28	1/29-2/4	2/5-11	2/12-18	2/19-25	2/26-3/4	3/5-11
	1	2	3	4	5	6	7	8	9	10
Swans:										
Whistling										
Trumpeter										
Geese:										
Canada						5	5	30	40	50
Cackling										
Brant										
White-fronted										
Snow										
Blue										
Other										
Ducks:										
Mallard							50	500	800	1,000
Black							5	50	100	150
Gadwall										5
Baldpate									10	20
Pintail								500	800	900
Green-winged teal									10	20
Blue-winged teal										
Cinnamon teal										
Shoveler										
Wood						5	5	50	100	200
Redhead										
Ring-necked									5	20
Canvasback										
Scaup										
Goldeneye									1	
Bufflehead										
Ruddy										
Other Hood.Merganser								5	5	10
Common merganser								5	5	5
Coot:										

NR-1 From January to April 1971

3-1750a
Cont. NR-1
(Rev. March 1953)
5RF - 4/68

WATERFOWL
(Continuation Sheet)

REFUGE Great Swamp NWR MONTHS OF January TO April, 19 71

(1) Species	(2) Weeks of reporting period: 3/12-18 (11)	3/19-25 (12)	3/26-4/1 (13)	4/2-8 (14)	4/9-15 (15)	4/16-22 (16)	4/23-29 (17)	4/30 (18)	(3) Estimated waterfowl days use	(4) Production*(over) Broods seen	Estimated Total
Swans.											
Whistling											
Trumpeter											
Geese:											
Canada	135	100	80	70	70	60	60	60	4,995		
Cackling											
Brant											
White-fronted											
Snow											
Blue											
Other											
Ducks:											
Mallard	1,800	1,500	1,200	1,800	1,000	500	500	500	75,050		
Black	350	230	200	300	300	100	50	50	14,435		
Gadwall	5	5	5	10	5	5	10	10	360		
Baldpate	80	60	50	50	40	20	-	-	2,310		
Pintail	1,400	1,000	900	1,200	500	200	20	5	51,945		
GW teal	120	100	150	200	300	200	100	100	8,500		
BW teal	5	10	30	50	50	50	50	50	1,765		
Cinnamon teal											
Shoveler	1	2	2	-	-	-	-	-	35		
Wood	650	450	420	400	400	400	600	600	26,360		
Redhead											
Ring-necked	30	30	20	10	10	10	5	-	980		
Canvasback											
Scaup											
Goldeneye											
Bufflehead											
Ruddy									189		
Other: Hooded Merg.	5	2	1	1	1	-	1	1	105		
Coot:	-	5	5	5	5	10	10	10	290		

(over)

NR-1 Cont. From January to April 1971

	(5) Total Days Use	(6) Peak Number	(7) Total Production
Swans			
Geese	4,995	135	
Ducks	182,041	4,446	
Coots	290	10	

SUMMARY

Principal feeding areas **Proposed Pools #1, 2 & 3 - heaviest spring migratory feeding occurred in Pool #3.**

Principal nesting areas **Proposed Pools #1, 2 & 3, Dodge Unit, Middle Brook, Goose Pen & small upland marshes & ponds.**

Reported by _____

INSTRUCTIONS

See Wildlife Refuges Manual Section 3321-24, "Wildlife Records".

(1) Species: In addition to the birds listed on form, other species occurring on the refuge during the reporting period should be added in appropriate spaces. Special attention should be given to those species of local and national significance.

(2) Weeks of Reporting Period: Estimated average refuge populations.

(3) Estimated Waterfowl Days Use: Average weekly populations x number of days present for each species.

(4) Production: Estimated number of young produced based on observations and actual counts on representative breeding areas. Brood counts should be made on two or more areas aggregating 10% of the breeding habitat. Estimates having no basis in fact should be omitted.

(5) Total Days Use: A summary of data recorded under (3).

(6) Peak Number: Maximum number of waterfowl present on refuge during any census of reporting period.

(7) Total Production: A summary of data recorded under (4).

* **Numerous goose, mallard and wood duck broods hatched befofe the end of the period but will be reported on the May-August forms.**

3-1750
Form NR-
(Rev. March 1953)

WATERFOWL

REFUGE Great Swamp MONTHS OF May TO August , 19 71

(1) Species	(2) Weeks of reporting period: 5/1-7 (1)	5/8-14 (2)	5/15-21 (3)	5/22-28 (4)	5/29-6/4 (5)	6/5-11 (6)	6/12-18 (7)	6/19-25 (8)	6/26-7/2 (9)	7/3-9 (10)
Swans:										
Whistling										
~~Trumpeter~~ Mute	---	---	---	---	---	---	---	---	---	---
Geese:										
Canada	80	90	100	110	100	90	90	90	90	90
Cackling										
Brant										
White-fronted										
Snow										
Blue										
Other										
Ducks:										
Mallard	600	800	950	1,100	1,200	1,250	1,300	1,300	1,300	1,300
Black	110	150	190	220	230	240	250	250	250	250
Gadwall	5	5	5	5	---	---	---	---	---	---
Baldpate										
Pintail										
Green-winged teal	50	50	50	40	30	20	20	20	30	40
Blue-winged teal	50	50	40	30	30	30	30	30	40	50
Cinnamon teal										
Shoveler										
Wood	900	1,200	1,400	1,600	1,700	1,800	1,900	1,950	2,000	2,000
Redhead										
Ring-necked										
Canvasback										
Scaup										
Goldeneye										
Bufflehead										
Ruddy										
Other										
Coot:	10	~~10~~	5	---	---	---	---	---	---	---

NR-1 From May to August 19 71

3-1750a
Cont. NR-1
(Rev. March 1953)
5RF - 4/68

WATERFOWL
(Continuation Sheet)

REFUGE Great Swamp MONTHS OF May TO August, 19 71

(1) Species	(2) Weeks of reporting period: 7/10-16 (11)	7/17-23 (12)	7/24-30 (13)	7/31-8/6 (14)	8/7-13 (15)	8/14-20 (16)	8/21-27 (17)	8/28-31 (4 18 da.)	(3) Estimated waterfowl days use	(4) Production: Broods seen	Estimated Total
Swans.											
Whistling											
Trumpeter/ Mute	---	---	---	---	---	---	---	1*	1*	---	---
Geese:											
Canada	90	90	80	80	80	80	80	80	10,890	12	55
Cackling											
Brant											
White-fronted											
Snow											
Blue											
Other											
Ducks:											
Mallard	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	146,600	20	600
Black	250	250	250	250	250	250	200	200	27,680		110
Gadwall	---	---	---	---	---	---	---	---	140		
Baldpate											
Pintail								15	60		
GW teal	50	60	70	80	80	90	100	100	6,560	1	30
BW teal	60	70	80	80	80	80	80	150	6,970	1	30
Cinnamon teal											
Shoveler								5	20		
Wood	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	221,150	55	1650
Redhead											
Ring-necked											
Canvasback											
Scaup											
Goldeneye											
Bufflehead											
Ruddy											
Other											
Coot:	---	---	---	---	---	---	---	5	195		

*Seen for only one day-new refuge record

(over)

	(5) Total Days Use	(6) Peak Number	(7) Total Production
Swans	10,890	110	55*
Geese	409,180	3,770	2420**
Ducks	195	10	
Coots			

SUMMARY

Principal feeding areas: Great brook marsh, Middle brook, flooded locations in the Wilderness area, and upland ponds and marshes in the Management Area.

Principal nesting areas: In vicinity of areas listed above. Because of the density of vegetation on the marsh areas, brood sightings there were largely restricted to chance encounters in periferal open waters and duck traps.

Douglas E. Roscoe, Biological Aide

Reported by _____

INSTRUCTIONS

See Wildlife Refuges Manual Section 3321-24, "Wildlife Records".

(1) Species: In addition to the birds listed on form, other species occurring on the refuge during the reporting period should be added in appropriate spaces. Special attention should be given to those species of local and national significance.

(2) Weeks of Reporting Period: Estimated average refuge populations.

(3) Estimated Waterfowl Days Use: Average weekly populations x number of days present for each species.

(4) Production: Estimated number of young produced based on observations and actual counts on representative breeding areas. Brood counts should be made on two or more areas aggregating 10% of the breeding habitat. Estimates having no basis in fact should be omitted.

(5) Total Days Use: A summary of data recorded under (3).

(6) Peak Number: Maximum number of waterfowl present on refuge during any census of reporting period.

(7) Total Production: A summary of data recorded under (4).

*Goose production equals actual broods seen.

**Duck production estimates for mallards, wood ducks, bwt & gwt were made by multiplying the number of broods seen (excluding possible duplications) times a rule of thumb average brood size of 6 ducklings (reared to flight stage) times 5 (a factor of x^3 was used last year) for broods not seen in densely vegetated swamps & marshes. For lack of better data black duck production was estimated to be the same as the previous year. 6 broods were seen last year & none this year but this could easily have been due to greatly reduced time afield in order to develop refuge objectives. At least as many pairs were seen this year as last.

3-1750
Form NR-
(Rev. March 1953)

WATERFOWL

REFUGE Great Swamp NWR MONTHS OF September TO December, 19 71

(1) Species	(2) Weeks of reporting period									
	9/1-7 : 1	9/8-14 : 2	9/15-21 : 3	9/22-28 : 4	9/29-10/5 : 5	10/6-12 : 6	10/13-19 : 7	10/20-26 : 8	10/27-11/2 : 9	11/3-9 : 10
Swans:										
Whistling										
Trumpeter										
Geese:										
Canada	80	80	80	90	100	120	200	150	200	150
Cackling										
Brant *	--	--	--	--	--	--	--	--	--	--
White-fronted										
Snow	--	--	--	--	--	--	1	--	--	--
Blue										
Other										
Ducks:										
Mallard	1300	1350	1400	1400	1800	2250	2500	3000	3200	3350
Black	200	150	1100	80	90	100	120	150	200	300
Gadwall										
Baldpate	--	20	20	20	8-	--	10	20	30	10
Pintail	10	10	10	20	40	60	80	60	50	80
Green-winged teal	100	150	200	250	300	250	50	100	230	200
Blue-winged teal	150	300	400	350	300	110	40	50	60	10
Cinnamon teal										
Shoveler	5	5	5	5	5	5	5	5	10	10
Wood	2000	2000	2200	2300	2500	2400	2000	2000	2350	2200
Redhead										
Ring-necked										
Canvasback										
Scaup										
Goldeneye										
Bufflehead										
Ruddy										
Other										
Coot:	5	10	10	20	20	20	20	20	30	40

*250 seen flying over W.O.C. blind during mid-October

NR-1 From September to December 19 71

3-1750a
Cont. NR-1
(Rev. March 1953)
5RF - 4/68

WATERFOWL
(Continuation Sheet)

REFUGE Great Swamp NWR MONTHS OF September TO December, 19 71

(1) Species	(2) Weeks of reporting period: 11/10-16 (11)	11/17-23 (12)	11/24-30 (13)	12/1-7 (14)	12/8-14 (15)	12/15-21 (16)	12/22-28 (17)	12/29-31 (3 XXdays)	(3) Estimated waterfowl days use	(4) Production: Broods seen	Estimated Total
Swans.											
Whistling											
Trumpeter											
Geese:											
Canada	150	225	150	250	250	250	200	150	19,525		
Cackling											
Brant											
White-fronted											
Snow	--	--	--	--	--	--	--	--	7		
Blue											
Other											
Ducks:											
Mallard	3500	3500	3850	4125	4500	3000	2500	2500	333,175		
Black	600	600	650	675	700	500	400	400	47,505		
Gadwall											
Baldpate	20	20	20	20	20	20	20	20	1,950		
Pintail	8	50	20	20	20	10	10	10	3,936		
GW teal	260	200	100	50	--	--	--	--	17,080		
BW teal	--	--	--	--	--	--	--	--	12,390		
Cinnamon teal											
Shoveler	10	5	5	5	5	5	5	5	715		
Wood	2000	1500	1000	1000	600	200	100	50	198,600		
Redhead											
Ring-necked											
Canvasback											
Scaup											
Goldeneye											
Bufflehead											
Ruddy											
Other											
Coot:	50	100	100	50	20	10	--	--	3,675		

(over)

NR-1 Cont. From September to December 19 71

	(5) Total Days Use	(6) Peak Number	(7) Total Production
Swans	--		
Geese	19,525	250	
Ducks	615,351	6,398	
Coots	3,675	100	

SUMMARY

Principal feeding areas Great Brook marshes, rye fields and beaver swamps on Black Brook and its tributaries.

Principal nesting areas

Reported by

INSTRUCTIONS

See Wildlife Refuges Manual Section 3321-24, "Wildlife Records".

(1) Species: In addition to the birds listed on form, other species occurring on the refuge during the reporting period should be added in appropriate spaces. Special attention should be given to those species of local and national significance.

(2) Weeks of Reporting Period: Estimated average refuge populations.

(3) Estimated Waterfowl Days Use: Average weekly populations x number of days present for each species.

(4) Production: Estimated number of young produced based on observations and actual counts on representative breeding areas. Brood counts should be made on two or more areas aggregating 10% of the breeding habitat. Estimates having no basis in fact should be omitted.

(5) Total Days Use: A summary of data recorded under (3).

(6) Peak Number: Maximum number of waterfowl present on refuge during any census of reporting period.

(7) Total Production: A summary of data recorded under (4).

3-1751
Form NR
(Aug. 1952)

MIGRATORY BIRDS
(Other than Waterfowl)

Refuge **Great Swamp NWR** Months of **January** to **April** 19**71**

(1) Species	(2) First Seen		(3) Peak Concentration		(4) Last Seen		(5) Production			(6) Total
Common Name	Number	Date	Number	Inclusive Dates	Number	Date	Number Colonies	Total # Nests	Total Young	Estimated Use
I. Water and Marsh Birds:										
Pied-billed grebe	**1**	**4/30**	**1**	**4/30**	**1**	**4/30**				**1**
Great Blue heron	**1**	**3/12**	**10**	**4/23-30**	**10**	**4/30**				**220**
Green heron	**10**	**4/23**	**10**	**4/23-30**	**10**	**4/30**				**80**
American bittern	**5**	**4/2**	**20**	**4/16-30**	**20**	**4/30**				**405**
Virginia rail	**50**	**4/9**	**200**	**4/23-30**	**200**	**4/30**				**2,650**
Black-crowned night heron	**1**	**4/23**	**1**	**4/23-30**	**1**	**4/30**				**8**
Sora rail	**50**	**4/16**	**200**	**4/23-30**	**200**	**4/30**				**1,950**
Common gallinule	**5**	**4/30**	**5**	**4/30**	**5**	**4/30**				**5**
II. Shorebirds, Gulls and Terns:										
Killdeer	**5**	**2/19**	**5**	**2/19-4/22**	**5**	**4/22**				**375**
Woodcock	**10**	**2/12**	**1,900**	**3/9-25**	**200**	**4/30**				**31,770**
Common snipe	**10**	**3/12**	**300**	**4/9-22**	**100**	**4/30**				**8,220**
Solitary sandpiper	**5**	**4/23**	**10**	**4/30**	**10**	**4/30**				**45**
Greater yellowlegs	**5**	**4/23**	**10**	**4/30**	**10**	**4/30**				**45**
Herring gull	**5**	**2/19**	**5**	**2/19-3/25**	**5**	**3/25**				**175**

(over)

(1)	(2)		(3)		(4)		(5)	(6)
III. Doves and Pigeons:								
Mourning dove	200	2/12	300	2/19-3/25	200	4/30		19,800
White-winged dove								
IV. Predaceous Birds:								
Golden eagle								
Duck hawk								
Horned owl								
Magpie								
Raven								
Crow								
Turkey Vulture	2	2/5	5	4/23-4/29	3	4/30		202
Sharp-shinned hawk	1	3/19	1	3/19-3/25	1	3/25		7
Red-tailed hawk	10	2/5	115	2/19-2/26	6	4/30		713
Red-shouldered hawk	4	2/5	4	2/5-4/30	4	4/30		340
Broad-winged hawk	1	4/16	1	4/16-4/22	1	4/22		140
Rough-legged hawk	1	2/5	3	2/19-2/25	1	4/22		91

INSTRUCTIONS

See Wildlife Refuges Manual Section 3321-24, "Wildlife Records".

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(2) First Seen: The first migration record for the species for the reporting period.

(3) Peak Numbers: Estimated number and inclusive dates when peak population of the species occurred.

(4) Last Seen: The last refuge record for the species during the season concerned.

(5) Production: Estimated number of young produced based on observations and actual counts.

(6) Total: Estimated species days use (average population X no. days present) of refuge during the reporting period.

3-175
Form NR
(Aug. 1952)

MIGRATORY BIRDS
(Other than Waterfowl)

Refuge Great Swamp NWR Months of January to April 19 71

(1) Species	(2) First Seen		(3) Peak Concentration		(4) Last Seen		(5) Production			(6) Total
Common Name	Number	Date	Number	Inclusive Dates	Number	Date	Number Colonies	Total # Nests	Total Young	Estimated Use
I. Water and Marsh Birds:										
II. Shorebirds, Gulls and Terns:										

(over)

NR-1A From Jan to April 1971
5RF-2/71

(1)	(2)		(3)		(4)		(5)	(6)
III. Doves and Pigeons:								
Mourning dove								
White-winged dove								
IV. Predaceous Birds:								
Golden eagle								
Duck hawk								
Horned owl								
Magpie								
Raven								
Crow								
Marsh hawk	1	1/15	1	1/15-4/15	1	4/15		31
Osprey	1	3/5	1	4/9-4/22	1	4/22		221
Sparrow hawk	10	1/22	15	2/5-4/30	15	4/30		260
Common crow	40	1/1	100	4/2-4/30	100	4/30		6,540
Long eared owl	2	1/1	1	4/1	1	4/1		91
Screech owl	40	1/1	40	1/1-4/30	40	4/30		4,200
Great horned owl	15	1/1	25	4/23-4/30	25	4/30		2,220
Barred owl	12	1/1	25	2/5-4/30	25	4/30		2,600

INSTRUCTIONS

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(5) Production: Estimated number of young produced based on observations and actual counts.

(6) Total: Estimated species days use (average population X no. days present) of refuge during the reporting period.

3-175
Form NI A
(Aug. 1952)

MIGRATORY BIRDS
(Other than Waterfowl)

Refuge Great Swamp Months of May to August 19 71

(1) Species	(2) First Seen		(3) Peak Concentration		(4) Last Seen		(5) Production			(6) Total
Common Name	Number	Date	Number	Inclusive Dates	Number	Date	Number Colonies	Total # Nests	Total Young	Estimated Use
I. Water and Marsh Birds:										
Pied-billed grebe	5	5/1	5	5/1-5/7	2	5/14				50
Great blue heron	10	5/1	15	7/17-8/31	15	8/31				265
Green heron	15	5/1	120	7/24-7/30	120	8/31		25	70	8,845
Common egret	1	7/31	1	7/31	1	7/31				1
Least bittern	2	5/1	30	7/17-8/31	30	8/31		7	15	2,375
American bittern	20	5/1	35	7/10-8/13	30	8/31		10	15	3,270
Common gallinule	10	5/1	100	7/24-8/31	100	8/31		15	40	12,000
King rail	5	5/1	20	8/7-8/31	20	8/31		3	10	1,130
Virginia rail	150	5/1	200	7/17-8/31	200	8/31		50	100	18,230
Sora	200	5/1	200	5/1-5/7	300	8/31				8,000
II. Shorebirds, Gulls and Terns:										
Killdeer	5	5/1	20	7/10-7/16	10	8/31				550
Woodcock	250	5/1	400	5/22-8/6	300	8/31		100	200	6,500
Snipe	50	5/1	50	5/1-5/7	10	6/4				1,050
Spotted sandpiper	2	5/8	5	7/31-8/31	5	8/31				225
Solitary sandpiper	20	5/1	50	5/8-5/14	5	8/31				1,140
Greater yellowlegs	10	5/1	20	5/8-5/14	10	8/31				600
Lesser yellowlegs	2	5/8	50	8/29-8/31	50	8/31				200
Pectorala sandpiper	5	8/29	20	8/30-8/31	20	8/31				45
Least sandpiper	5	8/29	10	8/30-8/31	10	8/31				25
Longbilled dowitcher	1	7/27	1	7/27	1	7/27				1

(over)

NR-1A From May to August 19 71
5RF-2/71

(1)	(2)		(3)			(4)	(5)		(6)
III. Doves and Pigeons:									
Mourning dove	150	5/1	700	7/17-7/23	300	8/31	250	500	51,275
White-winged dove									
IV. Predaceous Birds:									
Golden eagle									
Duck hawk									
Horned owl	20	5/1	20	5/1-5/21	10	8/31			1,615
Magpie									
Raven									
Crow	100	5/1	200	6/19-8/31	200	8/31	50	100	21,800
Turkey vulture	4	5/1	4	5/1-5/7	1	8/31			165
Red-tailed hawk	6	5/1	6	5/1-5/7	1	6/4			105
Red-shouldered hawk	6	5/1	10	5/29-8/31	10	8/31	4	4	1,132
Sparrow hawk	15	5/1	30	6/19-7/16	20	8/31	7	15	2,775
Screech owl	40	5/1	80	5/22-6/4	50	8/31	15	40	1,270
Barred owl	25	5/1	25	5/1-5/28	10	8/31			1,930

INSTRUCTIONS

See Wildlife Refuges Manual Section 3321-24, "Wildlife Records".

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(4) Last Seen: The last refuge record for the species during the season concerned.

(5) Production: Estimated number of young produced based on observations and actual counts.

(6) Total: Estimated species days use (average population X no. days present) of refuge during the reporting period.

3-1751
Form NR-...
(Aug. 1952)

MIGRATORY BIRDS
(Other than Waterfowl)

Refuge **Great Swamp** Months of **September** to **December** 19**71**

(1) Species	(2) First Seen		(3) Peak Concentration		(4) Last Seen		(5) Production			(6) Total
Common Name	Number	Date	Number	Inclusive Dates	Number	Date	Number Colonies	Total # Nests	Total Young	Estimated Use
I. Water and Marsh Birds:										
Pied-billed grebe	5	9/8-14	10	9/15-10/5	5	12/1-7				560
Great blue heron	15	9/1-7	15	9/1-7	1	12/29-31				759
Green heron	120	9/1-7	120	9/1-7	20	9/29-10/5				2,555
Common egret	2	9/15-21	2	9/15-21	1	10/13-19				42
Least bittern	30	9/1-7	30	9/1-7	10	9/15-21				420
American bittern	20	9/1-7	20	9/1-28	5	12/22-28				1,610
Little blue heron	1	9/1-7	1	9/1-21	1	9/15-21				21
Common gallinule	100	9/1-7	100	9/1-14	10	12/22-28				4,410
King rail	20	9/1-7	20	9/1-7	5	12/8-14				770
Virginia rail	200	9/1-7	200	9/1-28	50	12/29-31				12,000
Sora	300	9/1-7	300	9/1-7	10	12/31				12,000
II. Shorebirds, Gulls and Terns:										
Killdeer	20	9/1-7	100	9/15-10/5	5	12/29-31				3,725
Woodcock	250	9/1-7	2000	11/10-16	20	12/29-31				63,970
Snipe	10	9/1-7	100	9/15-28	5	12/29-31				3,935
Spotted sandpiper	20	9/1-7	20	9/1-7	5	9/8-14				175
Solitary sandpiper	5	9/1-7	50	9/15-21	5	10/6-12				770
Pectoral sandpiper	20	9/1-7	20	9/1-7	1	9/22-28				252
Greater yellowlegs	10	9/1-7	10	9/1-14	5	9/22-28				210
Lesser yellowlegs	50	9/1-7	50	9/1-7	5	9/22-28				735
Least sandpiper	10	9/1-7	10	9/1-14	5	9/22-28				210
Golden plover	1	9/15-21	7	10/13-19	7	10/13-19				48

(over)

NR-1A From **September** to **December** 19**71**

5RF-2/71

(1)	(2)		(3)		(4)		(5)	(6)
III. Doves and Pigeons:								
Mourning dove	300	9/1-7	300	9/1-10/19	150	12/29-31		30,550
White-winged dove								
IV. Predaceous Birds:								
~~Golden eagle~~ Osprey	1	9/2	2	10/6-12	1	10/13-19		30
~~Duck hawk~~ Sparrow hawk	1	9/1-7	40	9/22-10/5	5	12/29-31		2,325
Horned owl	10	9/1-7	10	9/1-7	6	12/29-31		760
~~Magpie~~ Screech owl	50	9/1-7	50	9/1-10/19	45	12/29-31		5,735
~~Raven~~ Barred owl	10	9/1-7	10	9/1-7	6	12/29-31		760
Crow	150	9/1-7	300	10/6-26	100	12/29-31		22,000
Long-eared owl	1	12/8-14	1	12/8-31	1	12/24-31		24
Saw-whet owl	1	12/8-14	2	12/29-31	2	12/29-31		13
Turkey vulture	1	9/1-7	2	9/29-10/5	1	12/8-14		112
Sharp-shinned hawk	1	10/13-19	1	10/13-19	1	10/13-19		7
Red-tailed hawk	1	10/13-19	5	12/15-31	5	12/29-31		211 000
Red-shouldered hawk	10	9/1-7	10	9/1-7 20	4	12/29-31		684 00
Broad-winged hawk	1	9/20	1	9/20	1	9/20		1
Marsh hawk	1	9/1-7	3	10/6-12	1	10/13-19		77

See Wildlife Refuges Manual Section 3321-24, "Wildlife Records".

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(4) Last Seen: The last refuge record for the species during the season concerned.

(5) Production: Estimated number of young produced based on observations and actual counts.

(6) Total: Estimated species days use (average population X no. days present) of refuge during the reporting period.

3-1750b
Form NR-1B
(Rev. Nov. 1957)

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE

WATERFOWL UTILIZATION OF REFUGE HABITAT

Refuge Great Swamp For 12-month period ending August 31, 1971

Reported by [signature] Title Assistant Refuge Manager

(1) Area or Unit Designation	(2) Habitat Type	Acreage		(3) Use-days	(4) Breeding Population	(5) Production
Entire refuge	Crops	15	Ducks	1,017,052	1,000	2,420
	Upland	1,895	Geese	19,455	30	55
	Marsh	3,100	Swans			
	Water	40	Coots	485		
	Total	5,050	Total	1,036,992	1,030	2,475
	Crops		Ducks			
	Upland		Geese			
	Marsh		Swans			
	Water		Coots			
	Total		Total			
	Crops		Ducks			
	Upland		Geese			
	Marsh		Swans			
	Water		Coots			
	Total		Total			
	Crops		Ducks			
	Upland		Geese			
	Marsh		Swans			
	Water		Coots			
	Total		Total			
	Crops		Ducks			
	Upland		Geese			
	Marsh		Swans			
	Water		Coots			
	Total		Total			
	Crops		Ducks			
	Upland		Geese			
	Marsh		Swans			
	Water		Coots			
	Total		Total			
	Crops		Ducks			
	Upland		Geese			
	Marsh		Swans			
	Water		Coots			
	Total		Total			

(over)

INSTRUCTIONS

All tabulated information should be based on the best available techniques for obtaining these data. Estimates having no foundation in fact must be omitted. Refuge grand totals for all categories should be provided in the spaces below the last unit tabulation. Additional forms should be used if the number of units reported upon exceeds the capacity of one page. This report embraces the preceding 12-month period, NOT the fiscal or calendar year, and is submitted annually with the May-August Narrative Report.

(1) **Area or Unit:** A geographical unit which, because of size, terrain characteristics, habitat type and current or anticipated management practices, may be considered an entity apart from other areas in the refuge census pattern. The combined estimated acreages of all units should equal the total refuge area. A detailed map and accompanying verbal description of the habitat types of each unit should be forwarded with the initial report for each refuge, and thereafter need only be submitted to report changes in unit boundaries or their descriptions.

(2) **Habitat:** Crops include all cultivated croplands such as cereals and green forage, planted food patches and agricultural row crops; upland is all uncultivated terrain lying above the plant communities requiring seasonal submergence or a completely saturated soil condition a part of each year, and includes lands whose temporary flooding facilitates use of non-aquatic type foods; marsh extends from the upland community to, but not including, the water type and consists of the relatively stable marginal or shallow-growing emergent vegetation type, including wet meadow and deep marsh; and in the water category are all other water areas inundated most or all of the growing season and extending from the deeper edge of the marsh zone to strictly open-water, embracing such habitat as shallow playa lakes, deep lakes and reservoirs, true shrub and tree swamps, open flowing water and maritime bays, sounds and estuaries. Acreage estimates for all four types should be computed and kept as accurate as possible through reference to available maps supplemented by periodic field observations. The sum of these estimates should equal the area of the entire unit.

(3) **Use-days:** Use-days is computed by multiplying weekly waterfowl population figures by seven, and should agree with information reported on Form NR-1.

(4) **Breeding Population:** An estimate of the total breeding population of each category of birds for each area or unit.

(5) **Production:** Estimated total number of young raised to flight age.

Interior Duplicating Section, Washington, D. C. 27580

REPORT OF BANDING ON Great Swamp REFUGE - CALENDAR YEAR 1971

Geese	Method of Trapping*	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Totals
Canada	CAGE;HD;DT							16		1**				17
Brant														
Ducks														
Mallard	CAGE						3	9	49					61
Black	CAGE							2	9					11
Gr.-Winged Teal	CAGE							1						1
Bl.-Winged Teal														
Wood Duck	CAGE						50	54	105					209
Eider														
Total Waterfowl							53	66	163					299
Other														
Mourning Dove	CAGE & Can						69							69
Woodcock	CAGE&Nite								10					10
Florida gallinule	CAGE								1					1

Quotas: Canada geese _____; Mallard _____; Blacks 50 ; Other Woodcock-as many as possible.
Wood duck (locals) 50 ; (non-locals) 100

*Method of Trapping: CAN - Cannon Net; CAGE - Cage; MIST - Mist Net; NITE - Night-lighting ; HD - Hand; DT - Drive Trap
**Captured by hand - had monofilament line wrapped around lower mandible and tongue.

Form NR-1D

5RF-1/3/67

3-17
Form NR-2
(April 1946)

UPLAND GAME BIRDS

Refuge **Great Swamp NWR** Months of **January** to **April** 19**71**

(1) Species	(2) Density		(3) Young Produced		(4) Sex Ratio	(5) Removals			(6) Total	(7) Remarks
Common Name	Cover types, total acreage of habitat	Acres per Bird	Number broods observed	Estimated Total	per-centage	Hunting	For Re-stocking	For Research	Esti-mated number using Refuge	Pertinent information not specifically requested. List introductions here.
Ring-necked pheasant	**2,000 a. of cropland, grass-land, brush, woodland edge & swamp**	**40**			**50:50**				**50**	**Stocking by private gun clubs adjacent to the refuge contin-ues to decline.**
Bobwhite quail	**1,200 acres of cropland, grass land & brush**	**240**			**50:50**				**5**	
Ruffed grouse	**3,000 acres of timber, brush & swamp**	**85.7**			**50:50**				**35**	
Eastern wild turkey	**3,000 acres of upland timber, brush & swamp**	**600**			**60:40**				**5**	**Approximately 20 were believed alive at the beginning of the year. As of 4/30, only 5 were known to be alive.**

3-17
Form NR-2
(April 1946)

UPLAND GAME BIRDS

Refuge Great Swamp Months of May to August 1971

(1) Species	(2) Density		(3) Young Produced		(4) Sex Ratio	(5) Removals			(6) Total	(7) Remarks
Common Name	Cover types, total acreage of habitat	Acres per Bird	Number broods observed	Estimated Total	per-centage	Hunting	For Re-stocking	For Research	Esti-mated number using Refuge	Pertinent information not specifically requested. List introductions here.
Ring-necked pheasant	1,200 acres of cropland, grass-land, brush, forest edge, & swamp	13.3	6	50	50:50				90	Limited stocking by sports-man's clubs in vicinity of refuge during Nov. and early Dec. Production & popula-tion seem down.
Bob-white	300 acres of cropland, grass-land and brush	160			50:50				5	No sightings since early May. (Quail are stocked by an adjacent landowner).
Ruffed grouse	2,500 acres of timber, brush and swamp	25	2		50:50				100	Population still low.
Eastern wild turkey	2,500 acres of upland timber, brush, and swamp	625	1*	10*	50:50				4	25 game farm turkeys released on the refuge on 11/19/70 by local sportsman's clubs. *A brood of 12 poults seen regularly in Basking Ridge (off refuge).

3-175
Form NR-2
(April 1946)

UPLAND GAME BIRDS

Refuge **Great Swamp** Months of **September** to **December** 19**71**

(1) Species	(2) Density		(3) Young Produced		(4) Sex Ratio	(5) Removals			(6) Total	(7) Remarks
Common Name	Cover types, total acreage of habitat	Acres per Bird	Number broods observed	Estimated Total	per-centage	Hunting	For Re-stocking	For Research	Esti-mated number using Refuge	Pertinent information not specifically requested. List introductions here.
~~Ring-necked~~ **pheasant**	~~1,200 acres of~~ **cropland, grass-land, brush, forest edge, & swamp.**	~~13~~			~~50:50~~				~~90~~ **(max.)**	~~Limited stocking adjacent to~~ **refuge by hunting preserves.**
Ruffed grouse	**2,500 acres of timber, brush & swamp.**	**25**			**50:50**				**100 (max)**	
Bob-white	**800 acres of crop-land, grassland & brush.**	**40**			**50:50**				**20**	**No sightings by refuge personnel but some stocked birds probably still present along Algonquin Gas Line. Ref. Mgr. saw a covey of 8-10 at the Ground Pine Trail on 1/23/72 which may have been there last year. These were most likely stocked north of the refuge.**
Eastern wild turkey	**2,500 acres of up-land timber, brush & swamp.**	**100+**			**50:50**				**22**	**On 11/7/71,22 game farm turkeys were released on the refuge by Morris Co. Farmer-Sportsman's Federation. Most of these were probably lost to gt. horned owls & other predators. Last sighting was on White Bridge Rd. (1 bird) just S of refuge in December.**

NR-2 - Upland Game Birds - Months of September to December 71

5RF-2/71

3 753
Form NR-3
(June 1945)

BIG GAME

Refuge GREAT SWAMP. Calendar Year 1971

(1) Species	(2) Density	(3) Young Produced	(4) Removals			(5) Losses			(6) Introductions	(7) Estimated Total Refuge Population		(8) Sex Ratio
Common Name	Cover types, Total Acres Habitat	Number	Hunting	Restocking	Research	Predation	Disease	Winter Loss	Number and Source	Period of Peak Use	As of Dec. 31	
White-tailed deer	4,500 acres of upland & swamp timber, marsh edge, croplands, fields and brush	230*	70	-	20	50	40	20	-	600	430	40:60(spring, 1971) Ration is slowly equalizing
*Estimated 350-400 deer in spring at 40:60 ratio = 230 does x 1 fawn/doe (small winter necropsy samle indicated production of slightly over one doe/fawn but seemed to be a bit high.)												
	14 fawns were captured, hock streamered and ear tagged											

Remarks: Estimated hunting removals include 35 by hunting on private and unposted land adjacent to and within approved refuge boundary and 35 by poaching & illegal shooting by "jack-lighters" and irate neighbors.
Predation estimate includes 20 by dogs and 30 by vehicles, fences, etc.
Disease includes early fawn mortality & old age (some disease-possibly a light outbreak of Epizootic hemhorragic-was suspected when several partly decomposed deer were located in or near water during the summer).
Winter loss was mostly doe fawns (based on March-April necropsy sample). Quite a few twin fawns were noted.
Doe fawns weren't gravid. Most deer stayed on refuge through 12/31/71 due to mild weather.

NR-3
5RF 1/69

INSTRUCTIONS

Form NR-3 - BIG GAME

(1) SPECIES: Use correct common name; i.e., Mule deer, black-tailed deer, white-tailed deer. It is unnecessary to indicate sub-species such as northern or Louisiana white-tailed deer.

(2) DENSITY: Detailed data may be omitted for species occurring in limited numbers. Density to be expressed in acres per animal by cover types. This information is to be prefaced by a statement from the refuge manager as to the number of acres in each cover type found on the refuge: once submitted, this information need not be repeated except as significant changes occur in the area of cover types. Cover types should be detailed enough to furnish the desired information but not so much as to obscure the general picture. Examples: spruce swamp, upland hardwoods, reverting agriculture land, bottomland hardwoods, short grass prairie, etc. Standard type symbols listed in Wildlife Management Series No. 7 should be used where possible. Figures submitted should be based on actual observations and counts on representative sample areas. Survey method used and size of sample area or areas should be indicated under Remarks.

(3) YOUNG PRODUCED: Estimated total number of young produced on refuge.

(4) REMOVALS: Indicate total number in each category removed during the year.

(5) LOSSES: On the basis of known records or reliable estimates indicate total losses in each category during the year.

(6) INTRODUCTIONS: Indicate the number and refuge or agency from which stock was secured.

(7) TOTAL REFUGE POPULATION: Give the estimated population of <u>each</u> <u>species</u> on the refuge at period of its greatest abundance and also as of Dec. 31.

(8) SEX RATIO: Indicate the percentage of males and females of each species as determined from field observations or through removals.

1754
Form NR-4
(June 1945)

SMALL MAMMALS

Refuge **Great Swamp NWR** Year ending April 30, **1971**

(1) Species	(2) Density		Removals					(4) Disposition of Furs						(5)
								Share Trapping						
Common Name	Cover Types and Total Acres of Habitat	Acres Per Animal	Hunting	Fur Harvest	Predator Control	Restocking	For Research	Permit Number	Trappers Share	Refuge Share	Total Refuge Furs Shipped	Furs Donated	Furs Destroyed	Total Population
Raccoon	**4,460 acres**	**27**												**165**
Red fox	**4,460 acres**	**178**												**25**
Gray fox	**4,460 acres**	**557**												**8**
Skunk	**4,460 acres**	**89**												**50**
Opossum	**4,460 acres**	**69**												**65**
Long-tailed weasel	**4,460 acres**	**178**												**25**
Gray squirrel	**2,200 a. upland timber**	**1.5**												**800**
Red Squirrel	**300 a. upland timber & mixed pine**	**6**												**50**
Cottontail rabbit	**1,200 a. cropland, brush & edge**	**2.7**												**420**
Mink	**4,460 acres**	**223**												**20**
Muskrat	**2,000 a. swamp & marsh**	**.47**												**4,200**
Beaver	**2,000 a. swamp, marsh & stream**	**333**												**6**
Woodchuck	**2,000 a. cropland, brush grassland, timber edge**	**67**												**30**

REMARKS:

INSTRUCTIONS

Form NR-4 - SMALL MAMMALS (Include data on all species of importance in the management program; i. e., muskrats, beaver, coon, mink, coyote. Data on small rodents may be omitted except for estimated total population of each species considered in control operations.)

(1) SPECIES: Use correct common name. Example: Striped skunk, spotted skunk, short-tailed weasel, gray squirrel, fox squirrel, white-tailed jackrabbit, etc. (Accepted common names in current use are found in the "Field Book of North American Mammals" by H. E. Anthony and the "Manual of the Vertebrate Animals of the Northeastern United States" by David Starr Jordan.)

(2) DENSITY: Applies particularly to those species considered in removal programs. Detailed data may be omitted for species occurring in limited numbers. Density to be expressed in acres per animal by cover types. This information is to be prefaced by a statement from the refuge manager as to the number of acres in each cover type found on the refuge; once submitted, this information need not be repeated except as significant changes occur in the area of cover types. Cover types should be detailed enough to furnish the desired information but not so much as to obscure the general picture. Examples: spruce swamp, upland hardwoods, reverting agriculture land, bottom land hardwoods, short grass prairie, etc. Standard type symbols listed in Wildlife Management Series No. 7 should be used where possible. Figures submitted should be based on actual observations and counts on representative sample areas. Survey method used and size of sample area or areas should be indicated under Remarks.

(3) REMOVALS: Indicate the total number under each category removed since April 30 of the previous year, including any taken on the refuge by Service Predatory Animal Hunter. Also show any removals not falling under headings listed.

(4) DISPOSITION OF FUR: On share-trapped furs list the permit number, trapper's share, and refuge share. Indicate the number of pelts shipped to market, including furs taken by Service personnel. Total number of pelts of each species destroyed because of unprimeness or damaged condition, and furs donated to institutions or other agencies should be shown in the column provided.

(5) TOTAL POPULATION: Estimated total population of each species reported on as of April 30.

REMARKS: Indicate inventory method(s) used, size of sample area(s), introductions, and any other pertinent information not specifically requested.

3-17.
Form NR-7
(Rev. June 1960)
5RF-10/64

NONAGRICULTURAL COLLECTIONS, RECEIPTS, AND PLANTINGS 1/

Refuge Great Swamp NWR Year 19 71

	Collections and Receipts (Seeds, rootstocks, trees, shrubs)						Plantings (Marsh - Aquatic - Upland)						
Species	Amt. (lbs., bu., etc.)	2/ C or R	Date	Method or Source	Cost	3/ Total Amount on hand	Location of Area Planted	Rate of Seeding or Planting	Area Planted (Acres or Yards of Shoreline)	Amount and Nature of Propagules	Date	Percent Survival	Cause of Loss
Partridge pea	2 lbs	R	Spring	S.C.S.			Tract 10g	8 lbs/ acre	½ acre			50	Soil fertility Planting method
Multiflora rose	2,000	R	Spring	Flickingers Nursery	$80	-	Tracts 10g,10Aj, 236	3'/plant		2,000 sprigs	4/6	30-70	Soil fertility Planting method Deer browse
Norway spruce	1,000	R	Spring	"	$30		Tracts 10Aj,236	3'/plant		1,000 seedlings	4/12	30	Planting method Deer browse
Honeysuckle	100	R	Spring	S.C.S.	-	-	Tracts 10Aj	3'/plant		100 sprigs	4/8	10	Planting method Deer browse
Japanese millet	300	R	Late Spring	Scarlett	$36	-	Tracts 10g,247a, 234	25/acre	3,450 yds.			80	Planting method

1/ Report agronomic farm crops on Form NR-8
2/ C = Collections; R = Receipts
3/ Use "S" to denote surplus

Total acreage planted:
Marsh and aquatic _____
Hedgerows, cover patches 6,000 feet
Food strips, food patches 1/4 acre
Forest Plantings _____

Remarks: Deer browsing on the sprigs and seedlings is a major problem. The net effect of this is not yet evident. The Japanese millet was considered successful, although one area near the Wildlife Observation Center was planted after the mud had dried.

3-1979 (NR-12)
(9/63)

Bureau of Sport Fisheries and Wildlife

ANNUAL REPORT OF PESTICIDE APPLICATION

INSTRUCTIONS: Wildlife Refuges Manual, secs. 3252d, 3394b and 3395

Refuge: **Great Swamp NWR**

Proposal Number: **71-1**

Reporting Year: **1971**

Dates of Application (1)	List of Target Pests(s) (2)	Location of Area Treated (3)	Total Acres Treated (4)	Chemical(s) Used (5)	Total Amount of Chemical Applied (6)	Application Rate (7)	Carrier and Rate (8)	Method of Application (9)
4/11;4/12	Aedes abseratus canadensis strictus vexans	1,000' band on the northeast, southeast and southwest boundaries	1,030	Abate (granular)	47 lbs active ingredient	.05 lbs/acre	Celatom 2.5 lbs/acre	Helicopter

10. Summary of results (continue on reverse side, if necessary)

3-17 ?
Form ..R-8
(Rev. Jan. 1956)
5RF-10/64

Fish and Wildlife Service Branch of Wildlife Refuges

CULTIVATED CROPS - HAYING - GRAZING

Refuge **Great Swamp NWR** County **Morris** State **New Jersey**

Cultivated Crops Grown	Permittee's Share Harvested		Government's Share or Return				Total Acreage Planted	Green Manure, Cover and Waterfowl Browsing Crops Type and Kind	Total Acreage
			Harvested		Unharvested				
	Acres	Bu./Tons	Acres	Bu./Tons	Acres	Bu./Tons			
Winter rye, clover, fescue, orchard grass					**10**		**10**	**Reed canary, rye, clover, orchard grass, timothy, millet or oats**	**19**
								Fallow Ag. Land	

No. of Permittees: Agricultural Operations **0** Haying Operations **2** Grazing Operations **0**

Hay - Improved (Specify Kind)	Tons Harvested	Acres	Cash Revenue	GRAZING	Number Animals	AUM'S	Cash Revenue	ACREAGE
Timothy - trefoil	**25**	**45**	**$187.50**	1. Cattle				
				2. Other				
				1. Total Refuge Acreage Under Cultivation				**48**
Hay - Wild	**1**	**2.3**	**$11.50**	2. Acreage Cultivated as Service Operation				**19**

DIRECTIONS FOR PREPARING FORM NR-8
CULTIVATED CROPS - HAYING - GRAZING

Report Form NR-8 should be prepared on a calendar-year basis for all crops which were planted during the calendar year and for haying and grazing operations carried on during the same period.

Separate reports shall be furnished for Refuge lands in each county when a refuge is located in more than one county or state.

Cultivated Crops Grown - List all crops planted, grown and harvested on the refuge during the reporting period regardless of purpose. Crops in kind which have been planted by more than one permittee or this Service shall be combined for reporting purposes.

Permittee's Share - Only the number of acres utilized by the permittee for his own benefit should be shown under the Acres column, and only the number of bushels of farm crops harvested by the permittee for himself should be shown under the Bushels Harvested column. Report all crops harvested in bushels or fractions thereof except such crops as silage, watermelons, cotton, tobacco, and hay, which should be reported in tons or fractions thereof.

Government's Share or Return - Harvested - Show the acreage and number of bushels harvested for the Government of crops produced by permittees or refuge personnel. Unharvested - Show the exact acreage and the estimated number of bushels of grain available for wildlife. If grazing is made available to waterfowl through the planting of grain, cover, green manure, grazing or hay crops, estimate the tonnage of green food produced or utilized and report under Bushels Unharvested column.

Total Acreage Planted - Report all acreage planted, including crop failures.

Green Manure, Cover and Waterfowl Grazing Crops - Specify the acreage, kind and purpose of the crop. These crops and the acreage may be duplicated under cultivated crops if planted during the year, or a duplication may occur under hay if the crop results from a perennial planting.

Hay - Improved - List separately the kinds of improved hay grown. Annual plantings should also be reported under Cultivated Crops, and perennial hay should be listed in the same manner at time of planting.

Total Refuge Acreage Under Cultivation - Report total land area devoted to agricultural purposes during the year.

Permanent staff, left to right: Robert Delaney (Refuge Manager Trainee), Herbert Bell (Refuge Manager Trainee), Anita Penn (Clerk-typist), George Gavutis (Refuge Manager), Donald Goss (Maintenanceman), Elizabeth Chapman (Public Use Specialist), Thomas Mitchell (Assistant Refuge Manager), George Bagley (Maintenance worker).

Chapman

In spite of two extremely mild winters deer browse damage has continued to increase along with the size of our deer herd. Evergreens such as the red cedar and white pine are being particularly hard hit. The Humane Society suit, which stopped a planned controlled hunt during December, 1970, has still not been settled in court.

Mitchell

Five box traps fashioned after a New York State design have been used to ccapture deer during the winter months for marking. An intensive study has been initiated to learn more about our deer population's size, home range, and the carrying capacity of the refuge.

Gavutis

Biological Aid Doug Roscoe and Refuge Manager (Trainee) Bob Delaney capturing newborn fawn. A total of fourteen were caught on islands and along swamp and field edges during a two week period in late May and early June.

Gavutis

Note metal ear tags and plastic hock streamers for identification for population and movement studies. One particular doe backed the tagging crew up against a tree with her defensive antics.

Gavutis

Canada Geese continue to make increased use of our artificial nest structures. It's still hard to believe they can squeeze into our Mallard boxes (below) and spend a month incubating there.

Gavutis

Gavutis

Several very tame red fox cubs were regularly seen watching the construction of the Pool 1 access road.

Gavutis

Two tom turkeys from the November, 1970, release were frequently se seen near a bird feeder adjacent to White Bridge Road. A brood of 12 poults was reared near the Basking Ridge airport.

Dickson

Maintenance worker George Bagley using "cart" especially designed and constructed by Messrs. Delaney and Bagley for transporting boardwalk material to work sites. Nearly a mile of boardwalk interpretive trail was constructed through the swamp timber this year.

Dickson

Monarch Butterfly life history series by Assistant Manager Mitchell.

Gavutis

Screech Owls (above) and Barred Owls (below) are common but seldom seen refuge residents.

Gavutis

Gavutis

Our first free-flying Mute Swan was seen near Q-1 during one of our fall floods.

Gavutis

Use of our Wood Duck boxes was phenomenal with 209 nestings in the 211 available boxes (some were used twice). This occurred in spite of the fact that we have been doubling the number of boxes for the past few years. About 500 will be available next year.

Gavutis

A strange looking Wood Duck with a white head and neck, dark eye, bill, and crest showed up during the late summer. We never were sure of the sex but felt it was probably a male. It was seen several times in the Goose Pen and on the Q-1 pond.

Gavutis

Mitchell

Several of the above signs were installed by the transportation department at key intersections on interstate routes 202 and 287. Due to their small size, they are seldom seen by visitors.

Gavutis

We had planned a combined staff picnic for Great Swamp and Brigantine Refuges when the late August flood struck, It was held on the Q-1 island.

Gavutis

Late summer and fall this year brought the worst floods in history. "Doria" gave us 10.5" of rain in an 18 hour period. August's total precipitation was 14.07" and September's was 9.45". Above is the first bridge north of the Wildlife Observation Center on Long Hill Road.

Gavutis

The intersection of Pleasant Plains and White Bridge Road following "Doria". We kept reminding complaining neighbors that we were having the most rainy year in history but some of them insisted that we must somehow be the cause of all the flooding.

Mitchell

Our Pool 1 construction project bogged down completely and several thousand dollars worth of damage occurred to the partially finished dike, road and spillways. The peak flood crested somewhat higher than the finished dike level even though it had been designed to be high enough to preclude overtopping.

Gavutis

Deer were forced to take refuge on high ground for several weeks during the fall floods. One fawn was seen to panic and try to climb onto the back of an adult while swimming out of the lowlands.

Gavutis

Men had to resort to high axled vehicles or boats to travel over refuge roads.

Mitchell

Q-1 had a lot of privacy during the fall floods...

Gavutis

...except for the swimmers and curiousity seekers.

Gavutis

An underwater bicycle route?

Mitchell

Refuge Headquarters (unflooded): Office, left center; temporary shop, lower right; temporary storage building and welding shop, lower right center; temporary information booth, center; Q-205, upper center; deer traps, lower center.

Gavutis

The Golden Plover was added to our bird list when this individual appeared during the fall floods. Our faith in many of our "reliable birders" was badly shaken when many of them identified it as either an Upland Plover or Buff-breasted Sandpiper. A few even felt that one individual of all three species was present (maybe they were right).

These photos (like several others) were included for their historical value--in spite of their poor quality.

Gavutis

Mitchell

Several least bittern nests were found in the Great Brook marshes.